TECHNOLOGY DEPARTMENT

THE PAPER INDUSTRY and PAPER WORLD

AN EDUCATIONAL NEWS MAGAZINE—JANUARY, 1948

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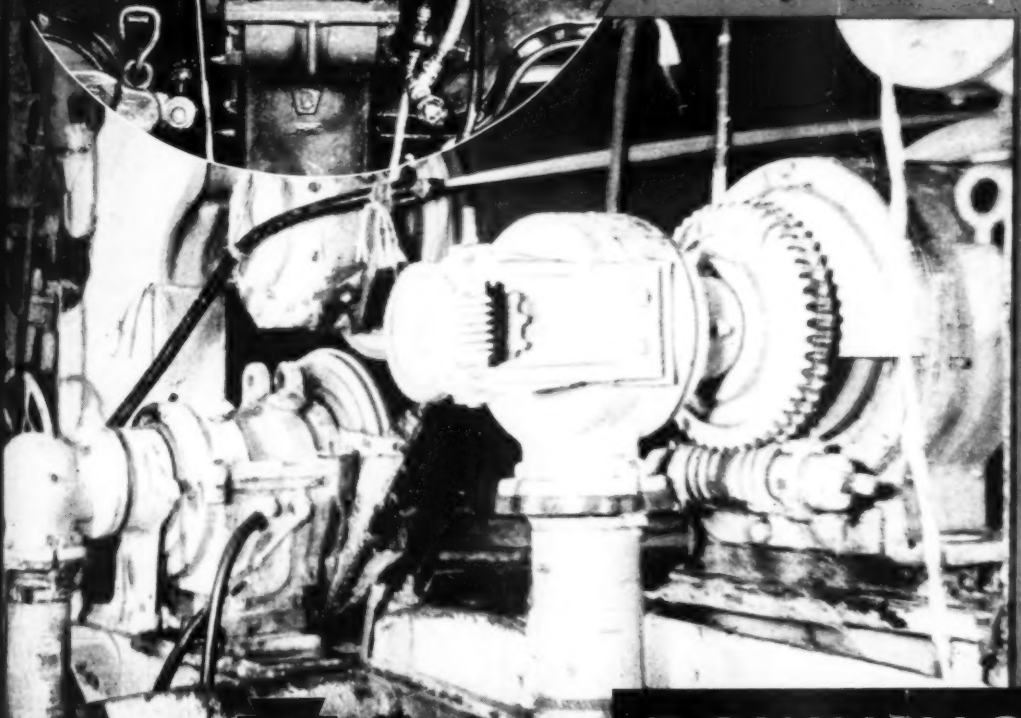
DETROIT

OLDEST MANUFACTURER OF MODERN SUCTION ROLLS

Photo in circle shows a modern Downingtown Suction Press Roll with suction connection thru a hollow leg at the front end. Picture below shows two pioneering designs of Downingtown Suction Presses which were installed 21 years ago at Scott Paper Co., Chester, Pa. These rolls are running today. Scott Paper Co. ordered their first Downingtown Suction Press in 1925. They now have 11 in operation.... Downingtown Mfg. Co., Downingtown, Pa.



Most Complete Line of
SUCTION ROLLS

Suction Couch
Suction Press
Suction Felt Cleaning
Suction Extractor
Suction Drum
Suction Cylinder Couch

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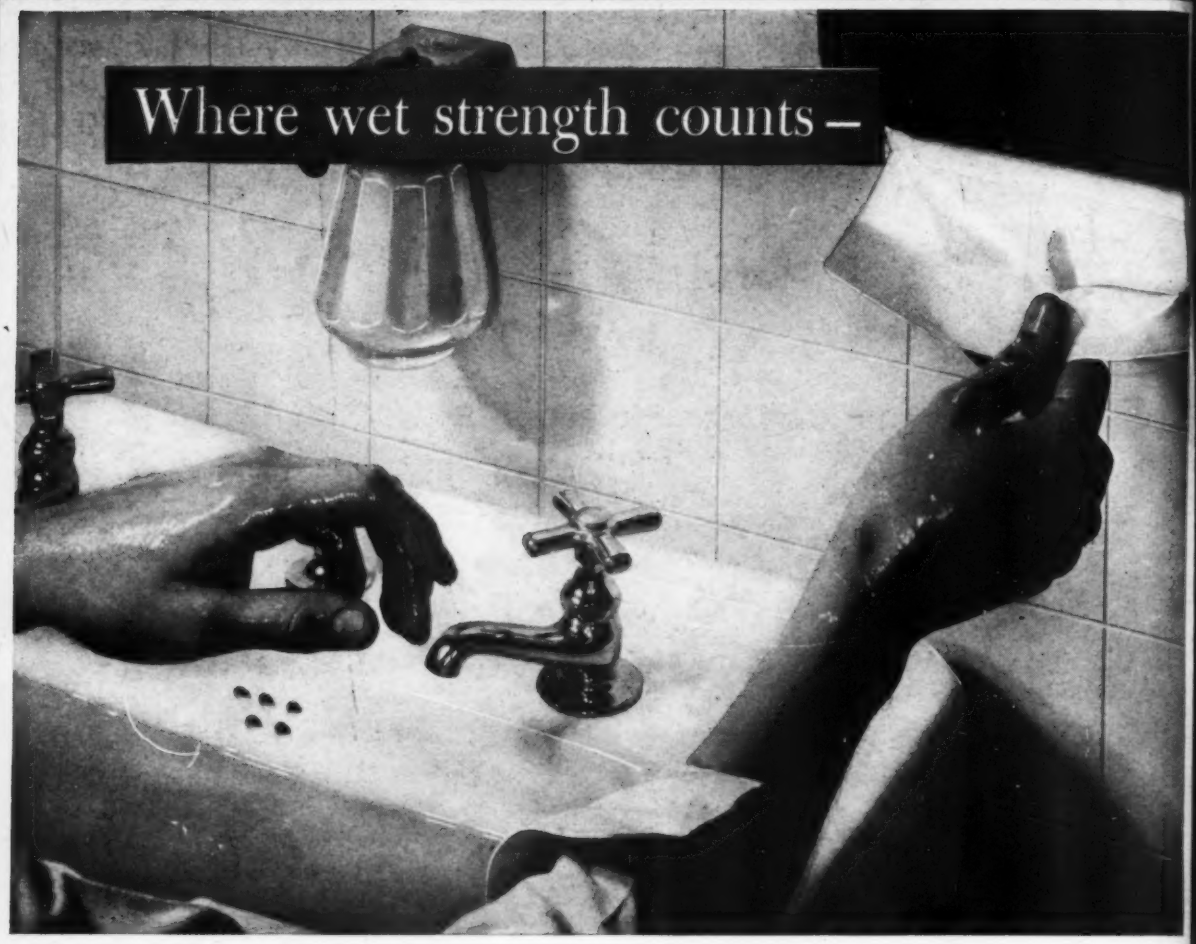
DOWNINGTOWN
Designers & Builders
Paper Making Machinery



—count on UFORMITES 467 and 470 for an effective, economical job

In paper toweling—and wherever wet strength is of prime importance—UFORMITE 467 and UFORMITE 470 are especially valuable. These urea formaldehyde resins increase wet strength substantially . . . and do it efficiently and economically.

UFORMITE 467 is particularly designed for use with Kraft by beater addition. UFORMITE 470 is recommended especially for sulfite stocks, can also be used advantageously with Kraft, rag and groundwood stocks, in the manufacture of high wet strength glassine, wrapping paper, chart and ledger paper or light weight absorbent tissues.

You can easily add these urea formaldehyde resins to your present manufacturing process . . . with no major change in your operating procedure. And—with no pretreatment, no special handling, no extra steps—as little as 1% resin solids on dry fibre weight will increase your paper wet strength as much as 300%!

And UFORMITES 467 and 470 do more than give you higher wet strength—they improve dry tensile and Mullen, fold, uniformity of sizing, and coating surface characteristics. Why not look into the many benefits resulting from these resins? We will be glad to send full details on request.

UFORMITE *is a trade-mark, Reg. U. S. Pat. Off.*

Represented by Cia. Rohm y Haas, S.R.L., Carlos Pellegrini 331, Buenos Aires, Argentina, and agents in principal South American cities

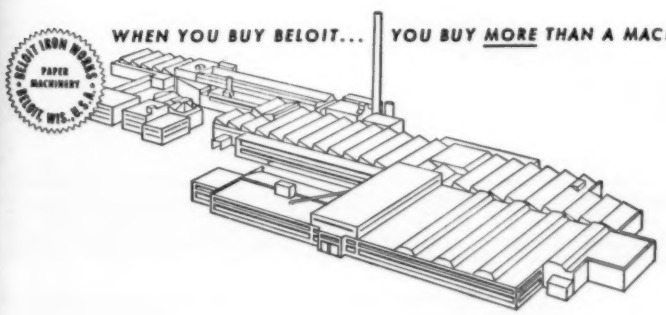
THE RESINOUS PRODUCTS & CHEMICAL COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

T
s
E
C

Eagle-eye dept.

Two men who know that satisfactory installation and start-up depend on rigid inspection of parts: Sales Engineer Charlie Spalding (*left*) and Chief Inspector Clarence McNabb, here discussing the quality of finish required on paper dryers for high-grade paper. Close collaboration between inspection and sales departments assures that exacting requirements of customers will be met. *Beloit Iron Works, Beloit, Wisconsin.*

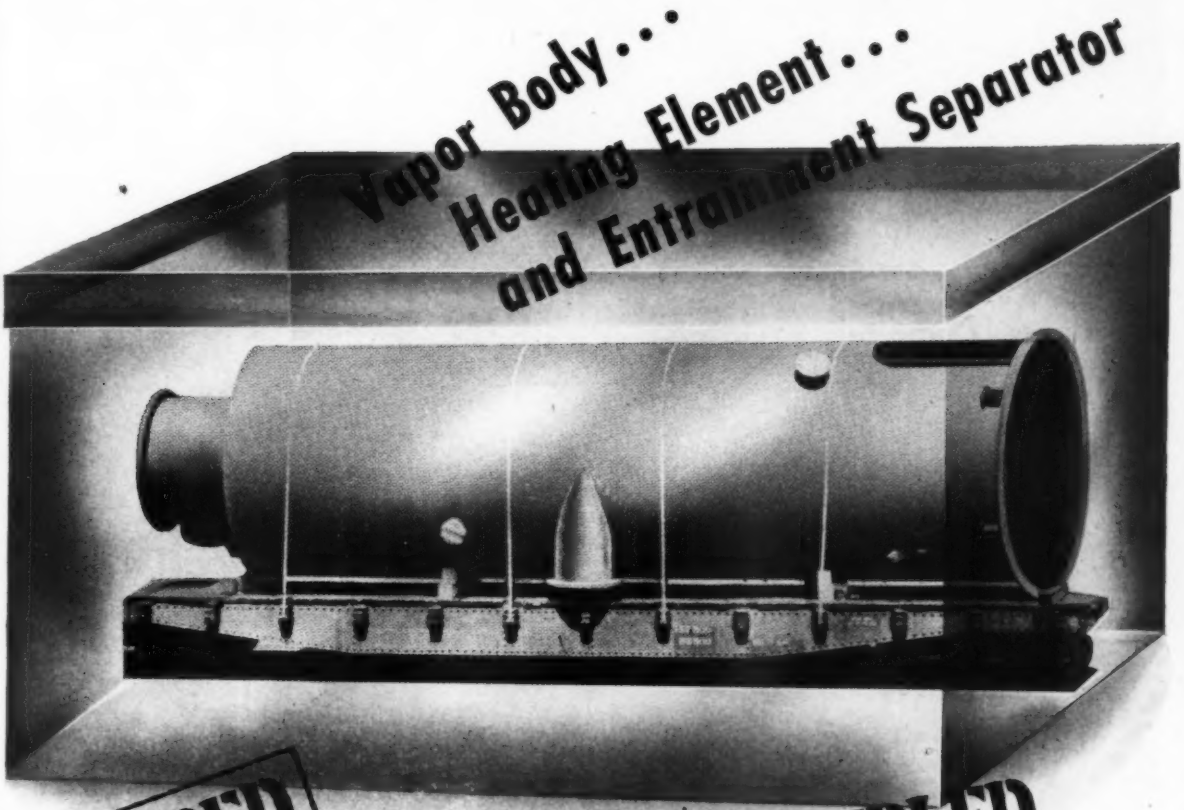


WHEN YOU BUY BELOIT... YOU BUY MORE THAN A MACHINE!

BELOIT

PAPER MACHINERY

APPLETON WOOLEN MILLS · APPLETON, WISCONSIN



SHIPPED COMPLETELY ASSEMBLED

Conkey Self-Supporting Evaporator Effects are shipped to you as a unit, with vapor body, heating element, and entrainment separator completely assembled. Thus, upon arrival at the site, it swings into place just as simply as you would erect any tower. Once you get a derrick over it, the job is practically done.

As its name implies, this new evaporator requires no structural supports, and thus it needs less floor space than conventional types of identical capacity. It needs no special housing, and may be set up out of doors if climatic conditions permit.

Ask a General American engineer to give you further information on other installation and operating advantages of this type of evaporator.

OTHER GENERAL AMERICAN EQUIPMENT

DIGESTERS
BLOW TANKS
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...of shipments has been most satisfactory", is a comment frequently made by Mathieson customers. Every effort is being made to maintain this dependable service. For 1948, we are carefully matching contract commitments against our productive capacity to make every possible pound of material available to our customers.

The Mathieson Alkali Works (Inc.)

60 East 42nd Street, New York 17, N. Y.

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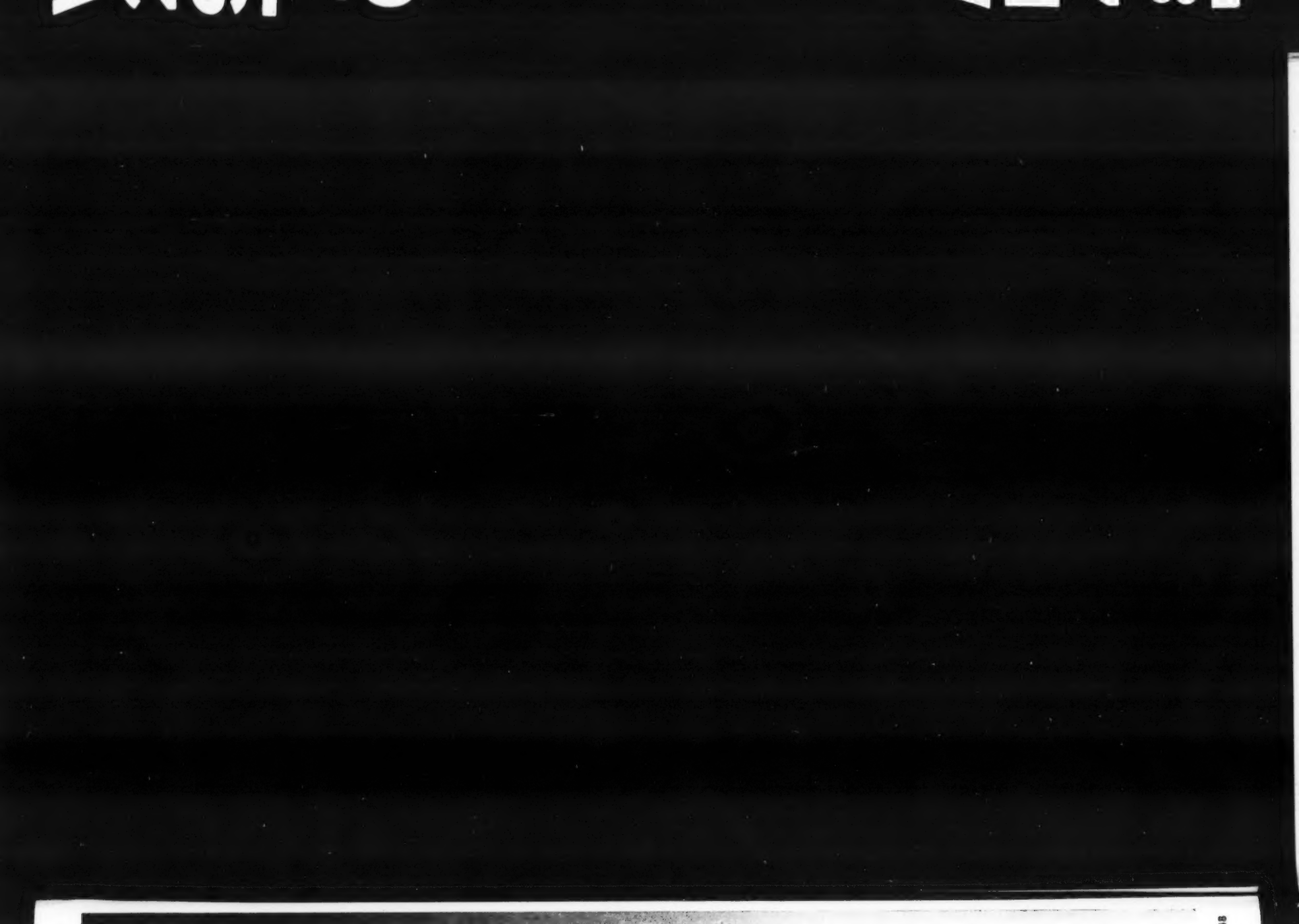
Caustic Soda . . . Soda Ash . . . Bicarbonate of Soda . . . Liquid Chlorine . . . Chlorine Dioxide . . . Ammonia, Anhydrous & Aqua . . . HTH Products . . . Fused Alkali Products . . . Dry Ice . . . Carbonic Gas . . . Sodium Chlorite Products . . . Sodium Methylate.



THE PAPER INDUSTRY and PAPER WORLD

(Reg. U. S. Pat. Off.)

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Published monthly by **FRITZ PUBLICATIONS, INC., 59 East Van Buren Street, Chicago 5, Illinois**

EDWARD B. FRITZ, Founder
A. SCOTT DOWD, President and Gen. Mgr.
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ADVERTISING REPRESENTATIVES

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THE PAPER INDUSTRY and PAPER WORLD is indexed regularly in "The Industrial Arts Index." An index to each volume is issued annually by the publisher as Section Two of the April number.

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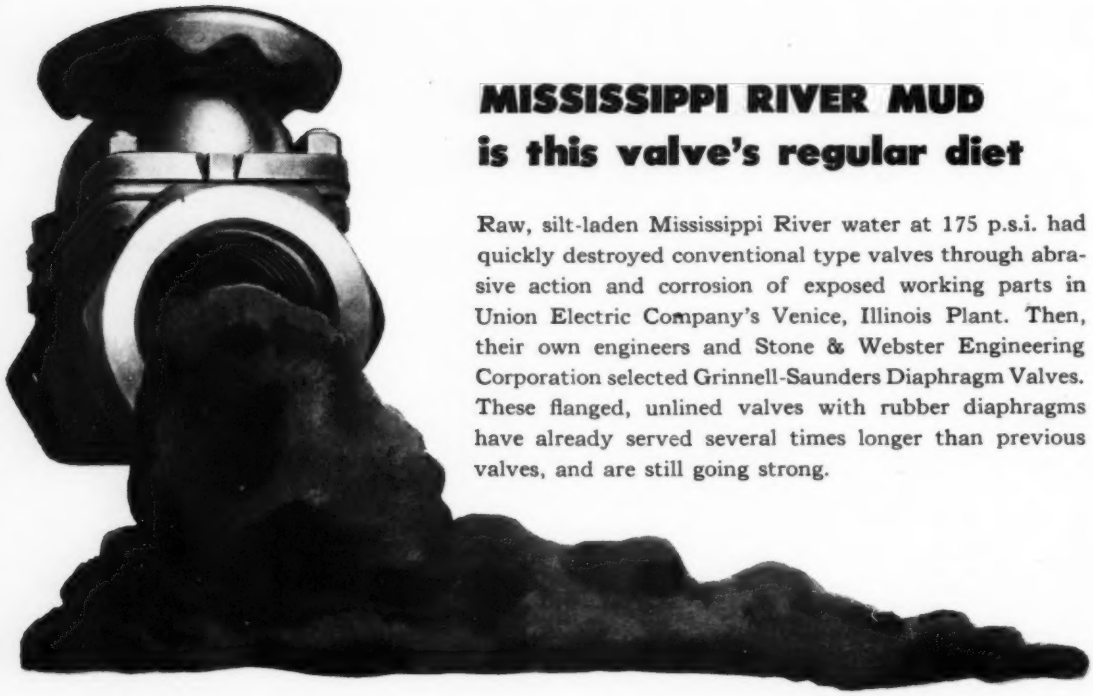
Member:
Audit Bureau of Circulation
Associated Business Papers, Inc.

Entered as second class matter June 29, 1938, at the post office at Chicago, Ill., under the Act of March 3, 1879. Subscriptions in the United States, U. S. Possessions, Canada, Cuba and Mexico, $2.00 for one year, $3.00 for two years. All other countries $3.00 for one year, $5.00 for two years.



MISSISSIPPI RIVER MUD is this valve's regular diet

Raw, silt-laden Mississippi River water at 175 p.s.i. had quickly destroyed conventional type valves through abrasive action and corrosion of exposed working parts in Union Electric Company's Venice, Illinois Plant. Then, their own engineers and Stone & Webster Engineering Corporation selected Grinnell-Saunders Diaphragm Valves. These flanged, unlined valves with rubber diaphragms have already served several times longer than previous valves, and are still going strong.

YOU, too, may find your answer to valve troubles due to corrosion, contamination or suspended solids, in

GRINNELL-SAUNDERS DIAPHRAGM VALVES

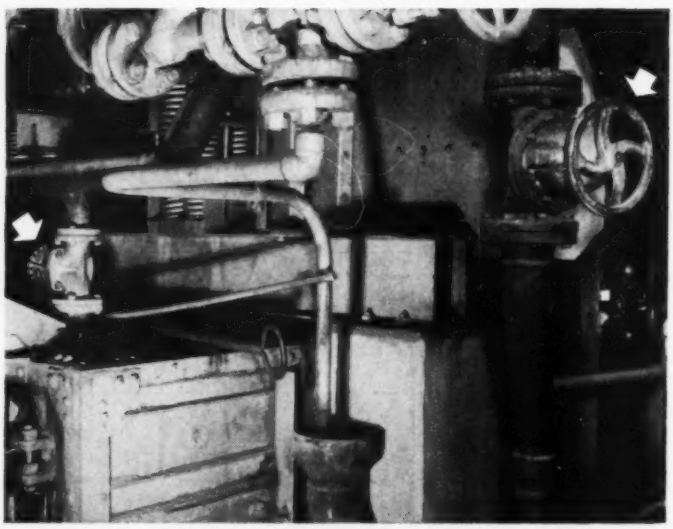
ISOLATED WORKING PARTS — The flexible diaphragm isolates working parts of the valve from the fluid, preventing contamination or corrosion.

CORROSION-PROOF LININGS — A selection of diaphragm materials and also body linings of glass, porcelain, lead, rubber or synthetics to suit your service requirements.

STREAMLINED FLOW . . . POSITIVE CLOSURE — Streamlined passage without pockets minimizes friction. Large area of contact of the diaphragm, plus diaphragm resilience, permit positive closure even when solids are trapped.

Write for catalog—Grinnell-Saunders Diaphragm Valves.

GRINNELL COMPANY, INC.
Providence 1, R. I.



Grinnell-Saunders Valves on ash sluicing lines in central power station.

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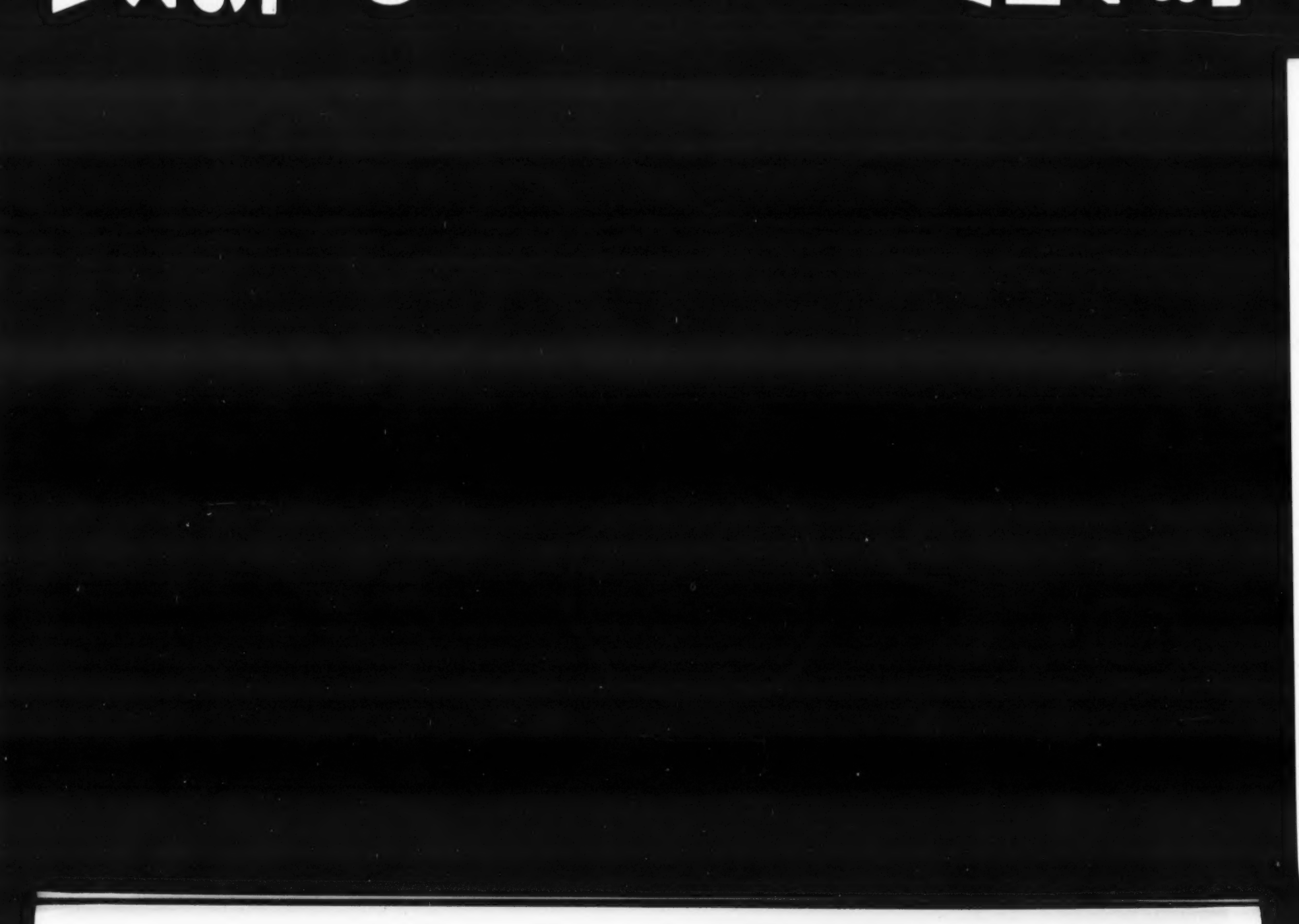
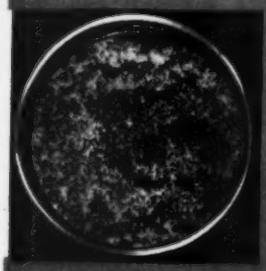
WHENEVER PIPING IS INVOLVED



The bugs can be...



in

or

out

DOWICIDES make the difference!

You can keep bacteria and fungi out of your operations—stop the losses they cause—with Dowicides, Dow's effective control agents.

In the pulp, paper and paper-board industries, where processing conditions foster costly fungus and bacterial growth, the Dowicides do a particularly effective job. Here they serve as ideal protection against mildew and rot . . . they eliminate mildew on lap stock, and their ability to overcome the destructive action of bacteria and fungi on machine felt—and to prolong felt life—makes them economically indispensable. In all of their broad range of applications, the Dowicides are economical and effective.

Where fungi and bacteria are the cause of operational difficulties the Dowicides should be considered. We would welcome the opportunity to discuss their application with you.

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

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St. Louis • Houston • San Francisco • Los Angeles • Seattle
Dow Chemical of Canada, Limited, Toronto, Canada

DOWICIDES

germicides and fungicides

CHEMICAL COMMENTS

MORE AND MORE JOBS FOR DOWFLAKE

Dowflake (Dow's convenient flake-form calcium chloride) has long been well known and valued in Portland cement concrete construction and for making gravel or similar type roads firm and dustless. But many and diversified are its other applications. It dust-proofs and freeze-proofs coal. It serves as a refrigerant in the frozen food industry as well as in leading warehouses and ice plants, where it circulates freely at sub-zero temperatures and reduces operating and equipment costs. It acts as an anti-freeze in fire barrels. And now it is more and more in demand as a de-humidifier of damp basements, game rooms and storage areas. Dowflake is a real career chemical!

50 YEARS WITH BROMINE

The first products manufactured by Dow over 50 years ago were the bromides—and today over 100 bromine products, both organic and inorganic, are being produced for use by many and varied industries. The story of these interesting chemicals and their properties make up a new booklet entitled, "Bromine and Bromine Products." A copy may be obtained by writing the nearest Dow office.

METHOCEL IS OUR "GOOD MIXER"

Methocel (Dow Methylcellulose) is soluble in water, and yields neutral solutions in a wide range of viscosities, varied to suit many diversified applications. Many industries, including paper, paint, leather, textiles and cosmetics, utilize Methocel's widely applicable properties which make it ideal as a dispersing, thickening, stabilizing, emulsifying, binding and coating agent.

Additional information about any of these products is available on request.

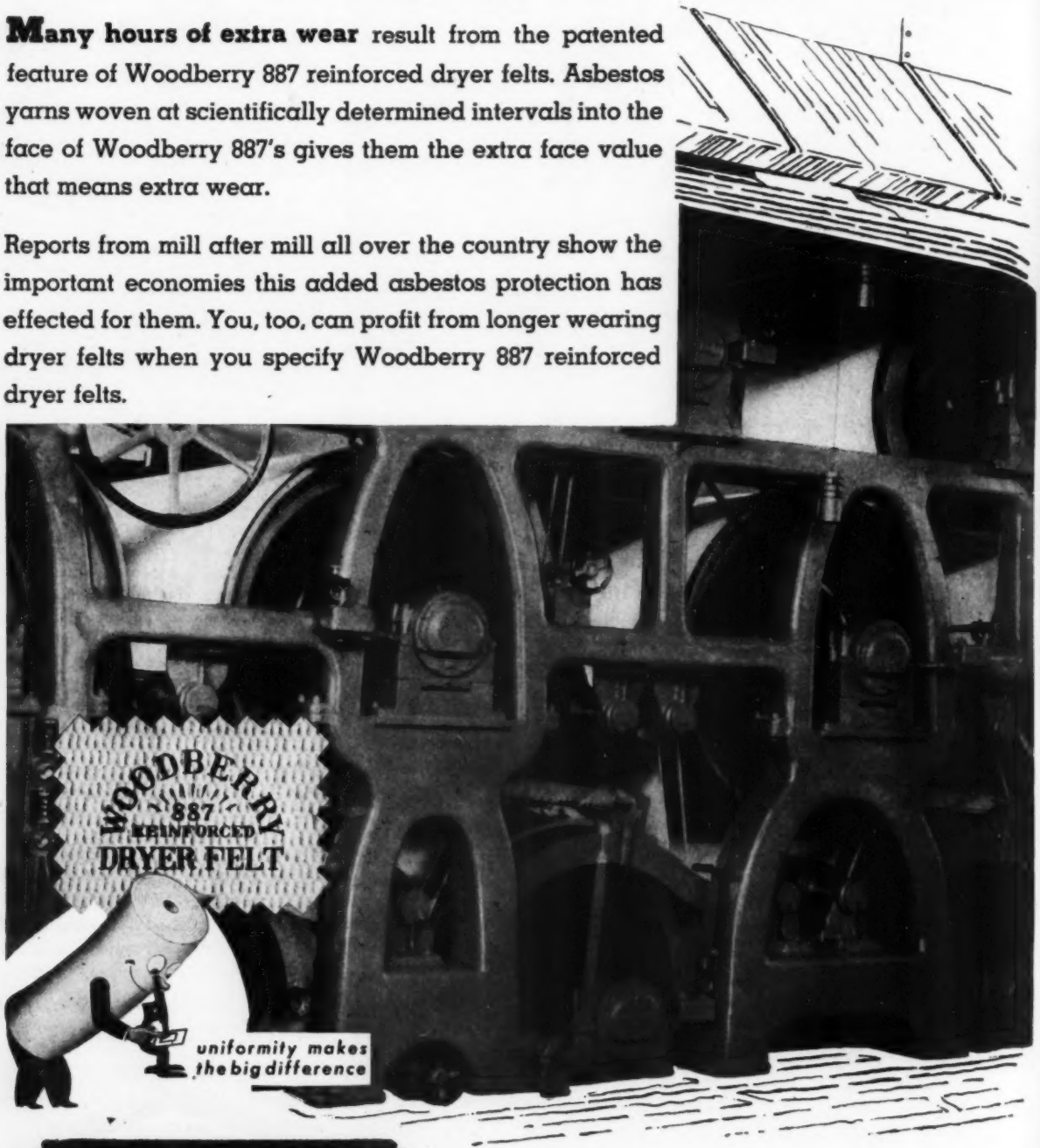
DOW

CHEMICALS INDISPENSABLE TO INDUSTRY AND AGRICULTURE

The Dollars and Sense of Choosing Woodberry 887 Dryer Felts

Many hours of extra wear result from the patented feature of Woodberry 887 reinforced dryer felts. Asbestos yarns woven at scientifically determined intervals into the face of Woodberry 887's gives them the extra face value that means extra wear.

Reports from mill after mill all over the country show the important economies this added asbestos protection has effected for them. You, too, can profit from longer wearing dryer felts when you specify Woodberry 887 reinforced dryer felts.



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40 WORTH ST. • NEW YORK

Mt. Vernon-Woodberry Mills

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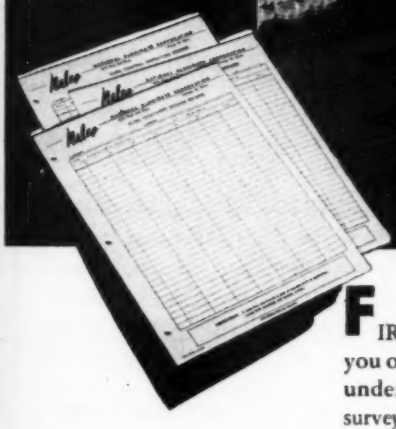
What Nalco
SLIME CONTROL SERVICE
can do in your mill!

Right — A section of the recently enlarged Nalco Microbiological Laboratories — where your slime control problems get the expert attention that leads to permanently satisfactory results.

Below — Simple Nalco report forms help to insure accurate routine control and analyses of day-to-day water and treatment conditions in your mill.



FIRST and foremost, **the Nalco Slime Control System can relieve you of the time, worry and effort involved in keeping slime conditions under control in your mill.** Nalco engineering and microbiological surveys establish the treatments needed for most economical control of your particular mill conditions. Simple control procedures are set up to provide accurate dosages for the numbers and types of slime-producing micro-organisms present. Provisions are made to vary treatment with changing day-to-day conditions. Nalco Field Service Engineers make regular calls to see that the Nalco System is operating at top efficiency. And the Nalco Laboratories keep an expert analytical eye on your entire treatment through detailed routine checks of samples from various sections of the mill.

Call your Nalco Representative for further details on Nalco . . . the *sure* way to permanently successful results.

NATIONAL ALUMINATE CORPORATION
6232 W. 66th Place, Chicago 38, Illinois
Canadian inquiries should be addressed to Aluminate Chemicals, Ltd.
555 Eastern Avenue, Toronto 8, Ontario

The Scientific System of Water Treatment for Pulp and Paper Mills

Nalco

WHY MONEL FACES BRING LONGER LIFE . . . LOWER COSTS

Many factors govern the life and performance of wire cloth faces and winding wire.

One of them is the wire itself.

Well known and proved is the corrosion resistance of Monel to pulps, paper mill stocks and white waters, caustic liquors and cleaning solutions of dilute muriatic and sulfuric acids.

Of equal importance is that Monel wire faces and winding wire are combined *safely* with bronze cylinder parts under corrosive conditions generally met in stock preparation.

Add to those qualities a rigidity almost twice that of bronze . . . add high strength, and resistance to abrasion and wear . . . and you have the reasons why mills report up to 10 years of continuous performance for Monel on washers, thickeners, cylinders and filters. And remember that Monel wire cloth is *lowest* in cost among wire cloths of comparable high strength and corrosion resistance.

For further information on Monel wire cloth, write for your copies of *Performance and the Reasons* and Bulletin C-3, *Monel, Nickel and Inconel in Pulp and Paper Mills.*

THE INTERNATIONAL NICKEL COMPANY, INC.

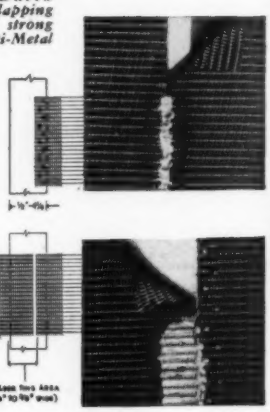
67 Wall Street, New York 5, N. Y.

EMBLEM OF SERVICE

INCO

Monel

Seams for Monel faces are readily made by silver soldering or welding. This improved butt joint for corduroy and twilled Dutch weaves eliminates over-lapping and produces a smooth, strong seam. Developed by Multi-Metal Wire Cloth Co.



1 ¾" x .014" Monel strip spotwelded to under side of one end. ½" to project.

2 Bring cover around to close fitting butt joint. Solder cloth to Monel strip and over butt joint.

ESTABLISHED TYPES OF MONEL WIRE CLOTHS for PULP and PAPER MILL SERVICES

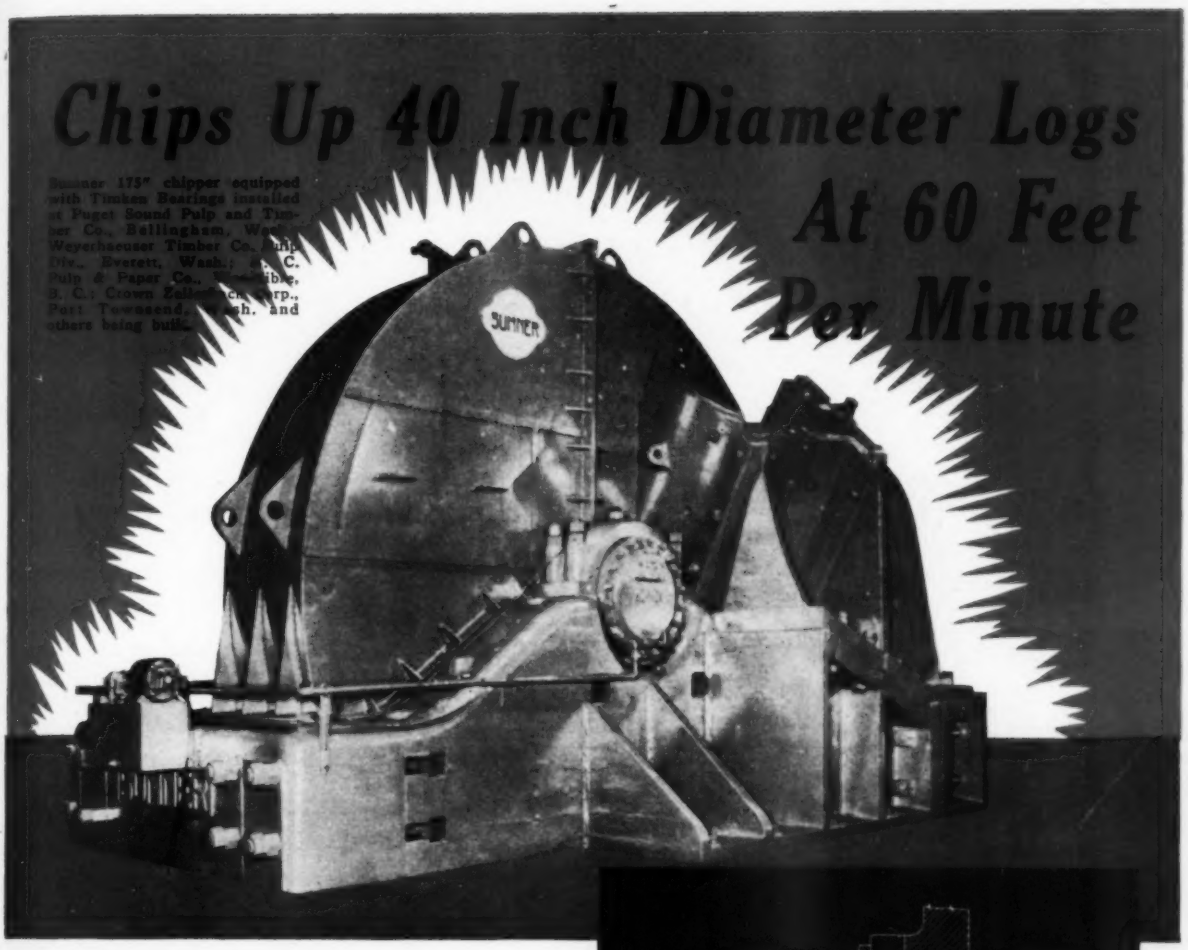
Pulp Thickeners	*Monel Backing Screens*	*Monel Top Screens*
VACUUM FILTERS	10, 12, 14 mesh*	40, 50, 60 mesh
SAVE-ALLS	10, 12, 14 mesh*	50, 60, 70, 80 mesh (12 x 64 corduroy cloth used without backing screen)
Unbleached Stock Washers VACUUM FILTERS	10, 12, 14 mesh*	30, 40, 50, 60 mesh
DECKERS AND CYLINDERS	12 x 64 mesh Monel and 14 x 88 mesh Monel corduroy cloth used without backing screen	
*Alkaline Bleached Stock Washers*** VACUUM FILTERS	10, 14 mesh*	40, 50 mesh
BOARD MACHINE CYLINDERS	10, 12, 14 mesh	30, 40, 50, 60 mesh
BEATER WASHER		40, 50, 60 mesh
Lime Sludge Filters VACUUM TYPE	14 x 100 mesh Monel, 24 x 110 mesh Monel, 200 twilled Dutch weave Monel and "AU-Type" extra heavy braided weave Monel for filter cloth	
Water Filters CYLINDER AND VACUUM TYPE	12 x 64 mesh Monel, 14 x 88 mesh Monel 80 mesh twilled Monel (wire dia. 0.007") 100 mesh twilled Monel (wire dia. 0.005") 120 mesh twilled Monel (wire dia. 0.004") 120 x 140 mesh twilled Monel (wire dia. 0.004")	
CLAY AND COLOR STRAINERS	150, 200 and 325 mesh Monel	

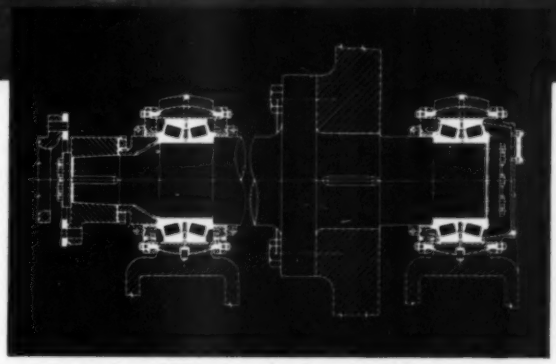
*10 mesh recommended for increased open area and drainage—**For chlorinated, acid-bleached stock washers Type 316 nickel-chromium-molybdenum alloy steel recommended.

This classification table is offered for your guidance through the courtesy of the Multi-Metal Wire Cloth Company, N. Y. *Write us for copies.*

Chips Up 40 Inch Diameter Logs At 60 Feet Per Minute

Sumner 175" chipper equipped with Timken Bearings installed at Puget Sound Pulp and Timber Co., Bellingham, Wash.; Weyerhaeuser Timber Co., Pulp Div., Everett, Wash.; [illegible] Pulp & Paper Co., [illegible], B. C.; Crown Zellerbach Corp., Port Townsend, Wash. and others being built.





Application of Timken Bearings on the disc arbor of the Sumner 175" chipper.

Sumner pulp mill chippers manufactured by Sumner Iron Works, Everett, Washington, have achieved outstanding service records wherever installed. They are noted for speed, stamina, long life, low maintenance.

The 175" chipper pictured above is the largest yet built. It reduces 40" diameter logs to pulp chips at the rate of 60 lineal feet per minute.

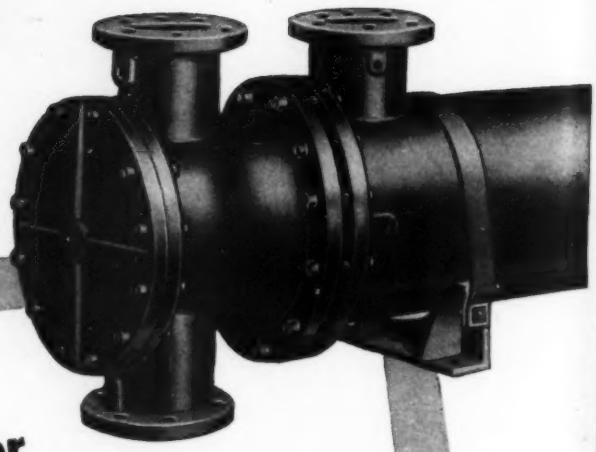
Like all Sumner chippers, the disc arbor is mounted on Timken Tapered Roller Bearings to assure smooth, frictionless operation; to give the disc stability and hold it in constant alignment; to safely carry the terrific thrust loads set up by the pressure of the logs against the disc and likewise handle any radial and combination loads that may develop.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

To be sure of getting all the advantages that only Timken Bearings can give, look for the trade-mark "TIMKEN" on every bearing you use. The Timken Roller Bearing Company, Canton 6, Ohio.

NOT JUST A BALL ○ NOT JUST A ROLLER ⊂⊃ THE TIMKEN TAPERED ROLLER ⊂⊃ BEARING TAKES RADIAL ◎ AND THRUST —◎— LOADS OR ANY COMBINATION —◎—

Beware of fouling...



Tube deposits can insulate your cooler against adequate heat transfer

DIMINISHING efficiency of your cooling equipment may mean that insufficient attention has been given to the fouling tendencies of fluids circulated. Watch for this in determining your cooler design. Either fluid, by its very nature or through local conditions, may be the type to leave a heat resistant residue on the inside or outside of the tubes. This acts as an insulation against heat transfer. Result: diminishing heat transfer rate and increasing maintenance beyond practical limits!

Make sure *YOUR* cooler will *CONTINUE* to perform at specified capacity. That's the strong point of the Ross "CP" design. Through selection and arrangement of standard, mass produced parts to suit *YOUR* operating conditions, Ross "CP" Coolers embody a large factor of safety against the effects of fouling under normal and fluctuating conditions.

Ross heat exchange engineers will quickly determine for you: proper velocities to minimize residue; temperature ranges necessary to discourage precipitation of carbonate on the tube wall; and correct fluid to be circulated through the tubes. Contact any Ross office, or write *Ross Heater & Mfg. Co., Inc.*, (Div. of American Radiator & Standard Sanitary Corp.), 1430 West Ave., Buffalo 13, N. Y.

In Canada, write Horton Steel Works, Ltd., Fort Erie, Ont.

Details on Continuous Performance at Specified Capacity in Free Bulletin 5322

Write today!

ROSS "CP" COOLERS

will maintain highest heat transfer at lowest maintenance for your installation

sizing

Maximum sizing and pH control call for careful selection of the chemicals used in paper making. Their quality must be uniform, their purity consistent, in order to insure perfect sizing. To take the guesswork out of their selection of Aluminum Sulfate and other paper-making chemicals, leading producers throughout the nation—

SPECIFY "GENERAL CHEMICAL"

ALUMINUM SULFATE

Standard—Ground, 99% thru 8 mesh, 95% thru 10 mesh; Powdered, 95% thru 100 mesh; and Lump.

Iron Free—Ground, thru 8 mesh; Lump, approximately 2½".

SODIUM SILICATE

Solutions: From 38° to 60° Baume — Wt. Ratio (Na_2O to SiO_2) from 1:2.00-1:3.40

Appearance: Opalescent to clear.

GENERAL CHEMICAL PRODUCTS for the PAPER INDUSTRY

- Aluminum Sulfate *(Standard and Iron Free)*
- Muriatic Acid *(Hydrochloric)*
- Sodium Fluoride
- Sodium Silicate
- Sodium Metasilicate
- Glauber's Salt, *Crystal or Anhydrous*
- Salt Cake
- Sodium Sulfide
- Sodium Hyposulfite
- Sodium Sulfite, *Anhydrous*
- Sodium Bisulfite, *Anhydrous*
- Disodium Phosphate
- Trisodium Phosphate
- Tetrasodium Pyrophosphate
- Sulfuric Acid
- Nitre Cake *(Sodium Bisulfate)*
- Nitric Acid
- Chrome Alum
- Aqua Ammonia

GENERAL CHEMICAL DIVISION
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INDIVIDUALLY ENGINEERED to your operating conditions—that's the Norton Pulpstone.

The three types of Norton abrasives, the many grain sizes, the many degrees of hardness and the several structures make it possible to provide a pulpstone that is exactly right for *you*—taking into consideration the kind of grinders in your mill and their power input, the type of wood you are grinding and the quality of pulp you desire.

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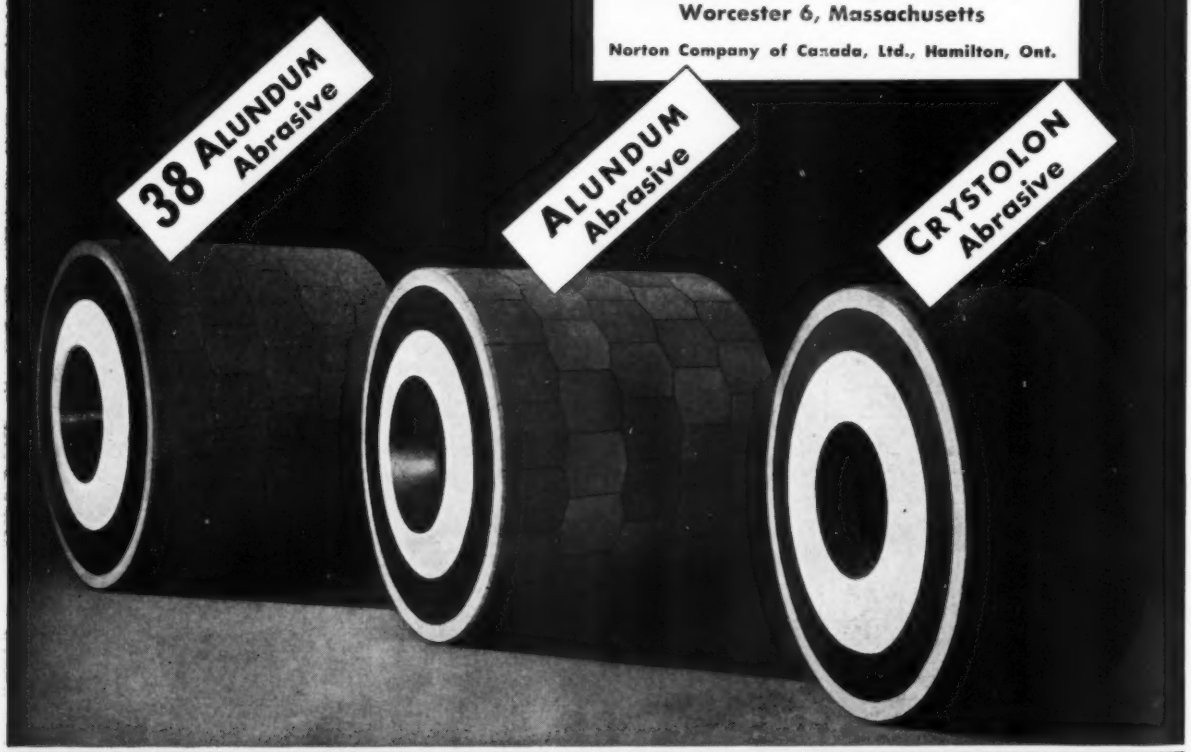

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Our field men are at your service as is our plant and all its people. We invite your inquiries.

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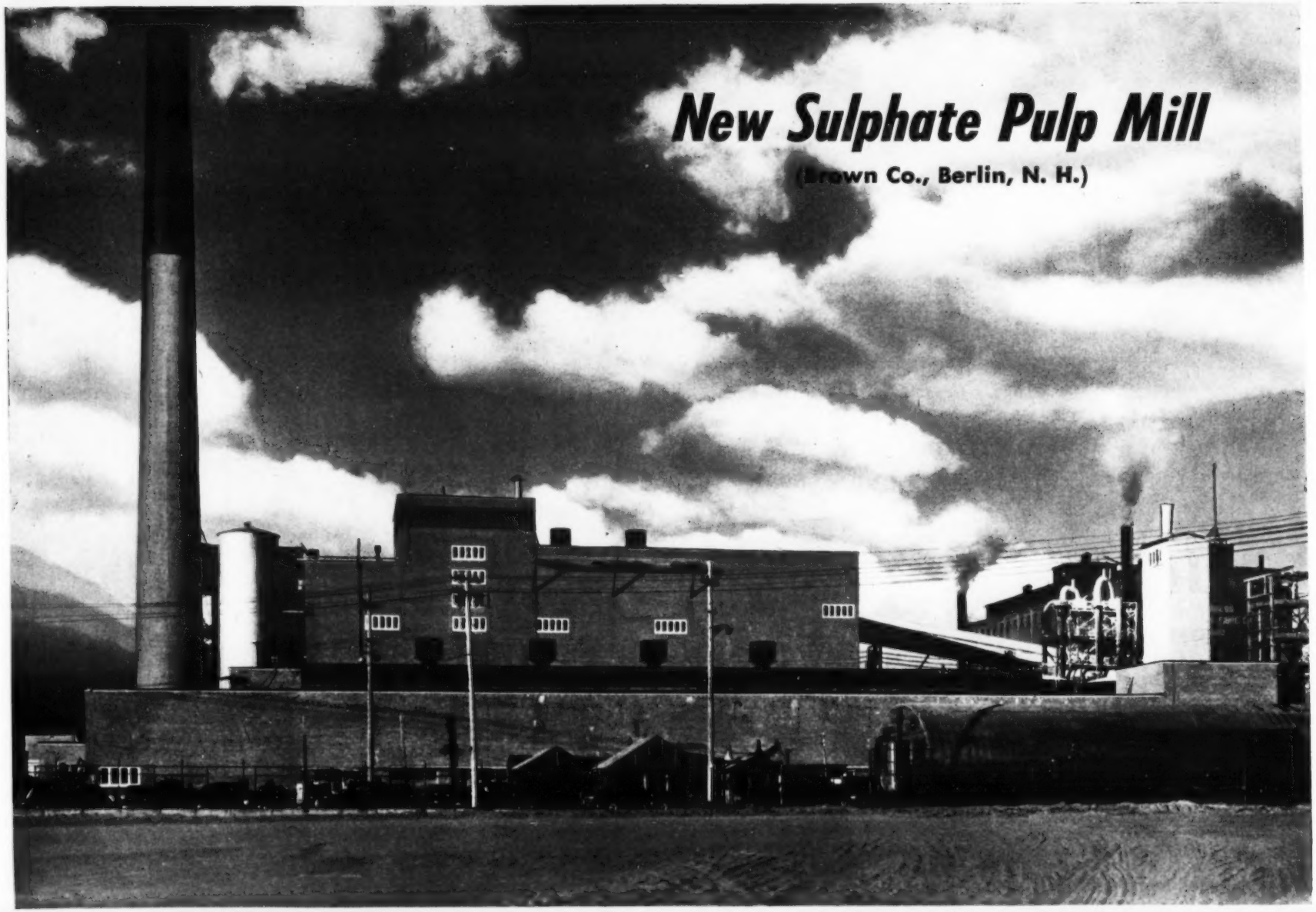
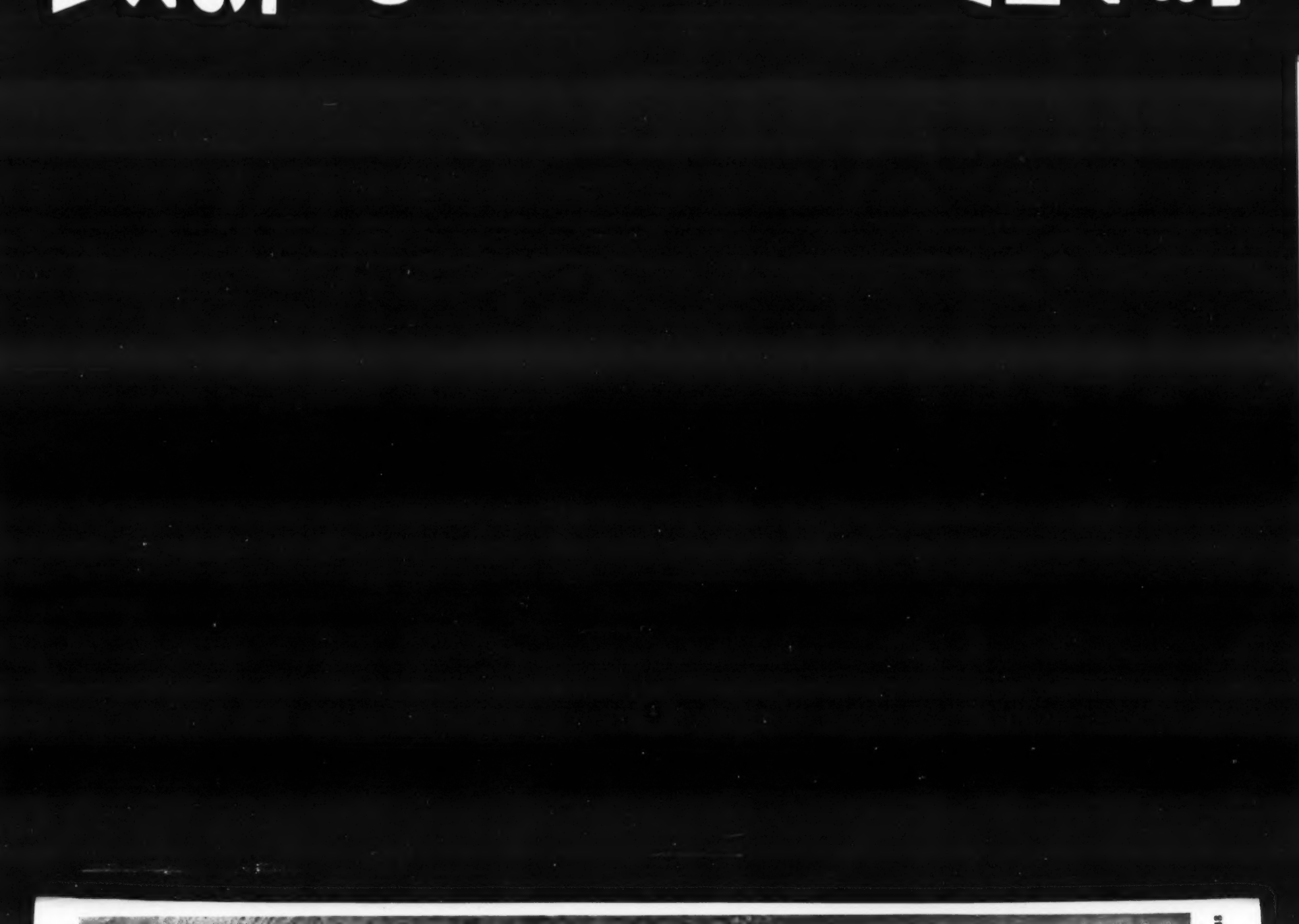

New Sulphate Pulp Mill
(Brown Co., Berlin, N. H.)



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TRADE WINDS

Pilot Plant at Michigan Paper Co. Will Test De-Inking Waste Process

▸▸▸ BY SERVING UP harmful organic content in certain types of paper mill waste as "food" for a specially-treated form of bacterial life, one of the Kalamazoo River's major pollution problems is on the verge of being conquered. According to Philip F. Morgan, resident engineer, this means that a way has been found to remove organisms that are responsible for oxygen depletion by having them devoured before they reach the river.

Mr. Morgan is an engineer for the National Council for Stream Improvement. He came to Kalamazoo in 1945 to study the stream pollution caused by paper mills in the Kalamazoo River Valley, to devise a system to eliminate or reduce it, and eventually to set up a pilot plant for perfecting a process on a commercially feasible basis.

He has been using facilities and assistant personnel in the chemical laboratories of Kalamazoo College for his preliminary studies. Now Mr. Morgan has arrived at the first concrete result with the erection of the $5,000 pilot plant for treatment of de-inking wastes at the Michigan Paper Company plant in Plainwell.

Mr. Morgan states that serious pollution of the river in the paper mill area is from four sources: (1) domestic waste from the cities, (2) mis-

LEFT—Pilot plant erected by the National Council for Stream Improvement at the Michigan Paper Company in Plainwell, Michigan, where biological treatment of de-inking wastes from paper mills is being tested as a means of preventing stream pollution by mills in the Kalamazoo River Valley. Seen atop the tanks are: Don Alguire, Plainwell, a chemical engineering student at Michigan State College, and George Ryan, Bronson, Michigan, senior chemistry student at Kalamazoo College, Kalamazoo, Michigan, where laboratory work is being carried on in the study . . . RIGHT—Phillip F. Morgan, resident engineer for the National Council for Stream Improvement, placed in charge of the de-inkng waste treatment study (left) looks at the big pilot plant tank where de-inking waste is going through an aeration process as bacteria attack the organic material that has made the waste an oxygen depletion agent in river water, thus killing aquatic life. At the right is Dwight Stocker, president of the Michigan Paper Company, book and newsprint mill, where the pilot plant is set up

cellaneous industrial wastes other than paper mill waste, (3) "white water" waste from the manufacture of paper and paperboard, and (4) de-inking waste.

The first two sources are capable of control, Mr. Morgan points out, other than through his field of operation. White water pollution has been reduced materially by the mills by filtration and reuse of the water by the mills and by reduction of its fiber content.

De-inking waste study looking to its elimination had been started long ago, with a definite attack begun at Mellon Institute of Industrial Research in Pittsburgh in 1944. There it was discovered that clarification of the waste water could be obtained by chemical means, but that not more than 10 to 20 per cent of the total organic material could be removed. Since organic material was at fault, it was obvious that in order to prevent oxygen depletion in the river receiving it, some biological treatment was needed.

The laboratory study started in Kalamazoo in September, 1945, under auspices of the National Council. Mr. Morgan and his aids found that a harmless type of bacterial life will feed on the harmful organic material present in the de-inking waste. It was determined that the organic material present could be assimilated by the nonpathogenic bacterial life which had no harmful effect on the oxygen content of the river water. Thus treated, de-inking waste discharged into the river could have no harmful effect and would not create a pollution problem.

Since last July, the pilot plant at Plainwell has been treating about 10 per cent of the liquid fraction of de-inking waste from the book paper mill. It is too early to say whether the pilot plant has proved itself a success, according to Mr. Morgan, but the information obtained will soon be correlated to determine if the process will be practical on a full scale basis.

The waste in the treatment vats is constantly aerated and sodium nitrate is added to aid the growth of bacterial life. According to tests in the thus far incomplete check, about 70 to 80 per cent of the organic material is being removed.

But Mr. Morgan points out that if these tests prove that the process so far as the organic material removal is practical on a mill-wide basis, there remains the problem of disposal of the primary sludge—that settled out before the biological treatment. Another problem is disposal occasionally of excess biological life in order to maintain the process at peak efficiency.

"Completion of the pilot plant and laboratory studies," said Mr. Morgan, "will provide basic data for treatment and plant design. These studies also will provide data for considering several alternate variations in type and degree of waste treatment."

◆

RECIPROCAL TRADE STILL FACES BATTLE IN CONGRESS

The opening of the new Congress will see the beginning of a battle royal between the Administration and Republican leaders over the manner in which the broad series of Reciprocal Trade Agreements has been put into effect. The issue seems to be not so much a complaint against specific reductions, but a general resentment at the cavalier manner in which the State Department has slashed rates on commodities all through the list. The Act under which these agreements were negotiated expires in June and the Administration plans to ask an extension of the law for another three years. This plan will be bitterly opposed. If any form of reciprocal agreements emerges from the Congressional hopper it seems likely that the modified law will greatly restrict the scope of the American negotiators of future agreements. It is openly charged that the negotiators of the recently announced agreements have gone far beyond the authority intended to be given.

Meanwhile, there are persistent reports, denied both in the United States and Canada, that preliminary plans already have been laid for further radical reductions in the rate schedules for international trade between the two countries. These reports range all the way from rumors of a free-trade Customs Union to stories that a new trade agreement with Canada is being discussed to further reduce the rates not touched by the conference at Geneva.

Whatever the truth of all these rumors, it is certain that there will be a bitter battle in Congress over the whole program. Its opponents go so far as to say that the Administration is definitely willing to sacrifice American standards of living to put foreign industries on their feet.

◆

INTERESTING COMMENT— SURVEYS & PAPER PRICES

New York newspapers which ridicule the denizens of the Bronx for believing that the West begins at the Palisades appear from their attitude toward the paper industry to be as greatly lacking in knowledge of the country at large and its paper needs. To the metropolitan newspaper, the only grade of paper known is newsprint.

A recent survey by the American Paper and Pulp Association of the future building plans of the paper industry, with details of proposed additions to capacity in many fields went unnoticed while elaborate attention was paid to plans for additional newsprint capacity. A recent survey of this field devoted special attention to plans for new construction in the South, particularly the projected Coosa River Newsprint company which is to build at Childersburg, Ala. Fourteen southern newspapers appear as heavy stockholders in an official statement filed with the Securities and Exchange Commission. The first public offering of securities in the new enterprise covers an issue of 238,829 shares of $50 par value common stock. Funds already received from newspaper publisher subscribers and other promoters together with proceeds of the new issue will make about $16,000,000 available and a later issue of $16,000,000 in 4 per cent first mortgage bonds is contemplated.

Meanwhile, the Canadian companies have generally announced an increase in the price of newsprint to a $96 base, an increase of $6 over the previous price. The Canadian companies continued to serve their publisher customers at the base price through the months when European newsprint was being offered and sold at prices ranging up to $250 per ton. Whether the publishers will show appreciation of this consideration in the future when demand has been met and prices may have slipped from their present highs remains to be seen. No such appreciation was shown for similar honoring of contracts in the famine period of the early '20s.

◆

FINANCIAL

▶▶▶ END OF THE YEAR securities prices showed little substantial difference from the quotations prevailing in recent months, but in general the prices are somewhat lower than those in effect at the end of 1946.

Crown Zellerbach Corporation—Net income for the six months ended October 31 was $9,567,899, as against $5,740,625 for the same period a year ago.

Marathon Corporation—Net earnings for the fiscal year ended October 31 were $4,654,457 as against $2,734,034 for the previous year.

Masonite Corporation—Net earnings for three months ended November 30 were $1,473,090 as against $911,463 for the same period last year.

San-Nap-Pak Mfg. Company—Net income for nine months ended Sep-

CENTENNIAL SPOTLIGHT
1848-1948

In this 100th anniversary year as Machine Builders for the Paper Industry, Puseyjones points with pride to outstanding post-war installations. In the spotlight . . . 245″ Fourdrinier Machine built for: The Champion Paper and Fibre Company, Canton, N. C.

PAPER · · · America's 6th Industry

SUDS FROM PAPER TISSUES

(NEWS ITEM: *Paper tissues impregnated with soap are a recent development for today's travellers.*)

Workers and travellers have found a new, easy way to carry soap with them. Paper tissues, in convenient purse-size booklets, are impregnated with soap. The user wets hands, wets one soap tissue thoroughly, and uses as an ordinary cake of soap. The used tissue is easily disposed of in a waste receptacle. Remaining soap sheets can be returned immediately to suitcase or purse with no danger of damaged fabrics. We will supply manufacturer's name on request.

Paper to polish silver . . . paper bags to package ice . . . paper cords for washday . . . new uses for paper calling for new standards of lightness and toughness, new standards of quality in performance. New responsibilities —new opportunities for the Pulp and Paper Industry.

The Puseyjones Organization is now devoting itself completely to the design and construction of Paper-Making Machinery built to new high standards of speed and efficiency, and to the modernization of existing machines. Additional capacity in Metals Fabrication is now available through conversion of facilities formerly devoted to the building of ships.

Puseyjones Engineers will welcome the opportunity to work with you in solving production problems.

THE PUSEY AND JONES CORPORATION
Established 1848. Builders of Paper-Making Machinery
Wilmington 99, Delaware, U. S. A.

THE SIGN OF TRADE MARK SUPERIOR QUALITY

tember 30 was $940,547 as against $554,064 earned a year ago in the comparable period.

United Paperboard Company, Inc.—Net income for the twenty-four weeks ended November 15 was $802,077 as against $377,015 for the same period a year ago.

West Virginia Pulp and Paper Company—Net income for the fiscal year ended October 31 was $10,935,424 as against $5,103,607 for the previous fiscal year. A large part of the earnings will be plowed back into replacement of outworn physical equipment.

Paper Mill Corporate Changes

American Writing Paper Corporation—On January 1 the company freed itself of the last of its outstanding bond issue by the redemption of $505,550, the last remaining portion of the original $3,000,000 issue floated in 1937.

National Container Corporation—The National Container Corporation has purchased the Aurora, Indiana, plant of the Martin Brothers Box Company.

The Paraffine Companies, Inc.—Stockholders will meet January 22 to vote on a proposal to issue three shares of common stock for each single share now held.

New York Stock Exchange—Stocks

	Closing Prices Dec. 31, 1947	Nov. 25, 1947	Dec. 31, 1946
A.P.W. Products..	5	5	5
Celotex	27⅛	27	31½
Same Pref.	*19⅜-20	20¼	20½
Certain-Teed Prod..	16½	17⅜	20⅝
Champion P&F Co.	22	22¼	25½
Same Pref.	*99-102	105	101
Container Corp.	42⅛	42⅛	47½
Same Pref.	*93⅛-95½	97	..
Cont. Diamond	11½	11⅜	10
Crown Zellerbach ..	33⅞	32½	32⅞
Same Pref. *98½-99	101⅝	105¼
Same $4 Pref....*126-128¾	122¾	122½
Dixie Vortex	*38-40	37½	31⅜
Same "a"	53	54½	51½
Robert Gair Co.....	8⅞	9⅜	7¼
Same Pref.	*19½-20	*19¾-20¾	21
Gaylord Container..	22⅞	22¼	18½
International Paper	54	55⅞	53½
Same Pref.	94½	98¼	105
Kimberly-Clark	21⅝	23½	23¼
Same Pref. *102½-104	106¾	..
McAndrews & Forbes	38½-39	39¼	35⅝
Marathon	22	21¼	..
Masonite	60	54½	63
Mead Corp.	19¾	21⅜	20½
Same Pref.	*93-94	93½	103½
Same 2nd Pref...	41½	*45¼-47	48
Nat. Container ...	13⅜	14⅛	37½ (Old)
Paraffine Cos.	74	77½	77½
Same Pref.	96¼	105	106¼
Rayonier, Inc.	30¼	30⅜	25½
Same, Inc.	33⅞	36⅜	36⅛
Scott Paper	44⅜	43⅝	47½
Same Pref.	*93-94	96⅜	100¼
St. Regis	10	10	10
Same Pref.	82	91	..
Sutherland Paper ..	*43¼-43½	41	46¼
Union Bag & Paper	33⅛	33⅛	27
United Paperboard	14½	16	16
U. S. Gypsum.....	105	104	105¾
Same Pref.	171	*179-183	188
U. S. Wall Paper..	5⅜	6¼	9⅜
Same Pref.	*33½-36	*39-39⅞	46
West Va. P&P Co..	44½	44	37⅜
Same Pref. *102-105	*106-107½	112

New York Stock Exchange—Bonds

Celotex 3½%	..	..	103¾
Champion P&F Co. 3%	98⅝	..	103½

New York Curb Exchange—Stocks

Am. Writing	9	..	9
Great Northern ...	47	47	44
Taggart	10½	..	8½

*Closing Bid and Asked Prices.

BRITISH PAPER NOTES
(November, 1947)

Nothing spectacular happens at present in the British Paper Trade either to awaken business or to brighten prospects, and it is anticipated that as the slowing up of the Home Trade in favor of exports operates, so the reduced demand will be felt.

To the observant eye, the effects of this slowing up in purchasing can be detected. Especially is this observable on the bookstalls. For the first time since the end of the war the railway bookstalls now display a number of the less popular books marked down in price in order to clear the shelves. Similarly many of the more popular monthly periodicals which a short time ago were snapped up directly after publication are now lying on the stalls for several days. In some instances piles of successive numbers can be seen side by side disclosing that the previous month's stocks are not cleared before the next month's arrive. Another feature is the diaries and calendars which appear to be experiencing a slower sale than in previous years.

Despite the emphasis on direct and indirect export a certain amount of paper must be left for home consumption otherwise industry could not function. However great is the desire for exports, it is still necessary to have account sheets, time sheets, ledgers, cheques, etc., to conduct business and it is in this direction that a great part of the merchant's supplies is consumed. Against this stringency on what might be considered a few reams of paper, more and more people are wondering what is happening to all the paper which goes by way of quota to the book publishers who still receive 60 or 80 per cent of their prewar consumption, particularly in view of the fact that there is stated to be a shortage of printers to print the books and even if they are printed, they are further delayed at the binders through shortage of labor.

In short, it is being openly discussed whether a slump is on the way not due to overproduction but to lack of spending power. Against this, a few people discern the first faint glimmerings of a turn in the tide of industry or rather a realization by a greater number of people that the constant interference with trade and more and more controls plus plans and super plans is producing greater scarcity rather than equality in distribution. To confirm this the gradual upward swing in coal production is the first healthy sign and mills do not anticipate a coal crisis this winter similar to that which operated during the early months of the present year. Waste paper collection is also improving and there is no talk now of a serious shortage of materials of all kinds which happened a few months ago although the imports of wood pulp are slowing up.

Imports of paper and boards show that wrappings are twice as heavy as last year and newsprint, although 50 per cent up on 1946, is beginning to reflect the effects of the recent decision to curtail imports for whereas September produced the figure of 9,825 tons, in October it was only 2,816 tons. These figures set against present Canadian production which in October reached the extraordinary high total of 396,251 tons representing 104.3 per cent of rated capacity confirms how little Great Britain is receiving and substantiates the announcement that the United States will receive possibly a further 100,000 tons of newsprint during next year from Canada and Newfoundland as a result of Great Britain's action.

Recent reports from Canada state that one and half million tons of newsprint machinery are idle throughout the world most of which is situated in Europe. Great Britain alone has a capacity of 800,000 tons but is permitted to produce only one-third of this quantity, representing an annual loss of 530,000 tons. As the world shortage of newsprint is estimated to be only one million tons, Britain, given normal conditions, could reduce this by half.

Despite the present low consumption of newsprint in Great Britain, a new ruling has still further tended to reduce this. Newspapers which experience a decline in sales are not now allowed to increase their number of pages to consume any spare paper accumulated thereby but must maintain the paging in operation between July 27 and August 24. It is reported that no more imports of newsprint will be received from Canada and Newfoundland this year, and owing to the drought in Scandinavia, future supplies of pulp for the manufacture of newsprint by the British mills are uncertain. Although 52,000 tons of newsprint will be imported from these two countries between January and June, 1948, it is anticipated that there will be a heavy drain on stocks during that period even to maintain present attenuated papers. Viewing the whole situation, one is led to wonder whether this report is not forecasting the possibility of two page papers.

Meanwhile the Paper Control has made a slight concession to the trade and technical journals for the present license period by releasing them from the 10 per cent cut imposed upon

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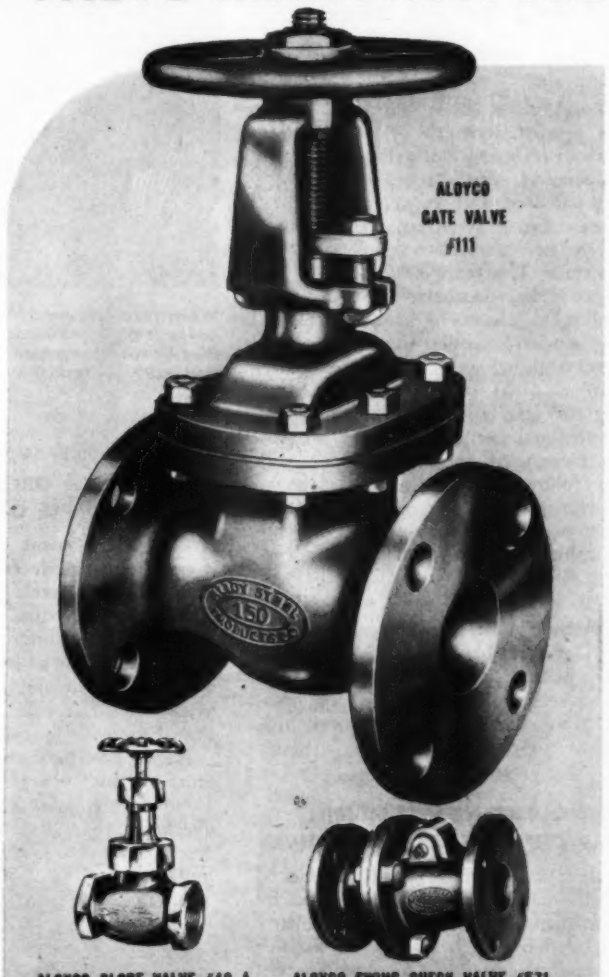
A high degree of science is involved in the manufacture of successful corrosion-resistant valves. The chemistry of corrosion, the metallurgy of stainless steels and mechanical engineering in the correct design of such valves, are all included in this science. Such skills are not acquired in a day. We have been at it a long time. That is why leaders in the process industries come to Aloyco for advice on corrosion-resistant valves. You, too, will find it profitable to consult our metallurgical service on your requirements.

Aloyco's new catalog #47 tells the story of this specialization and gives full details of alloys, types and applications. Send for your copy on your letterhead.



ALOYCO GLOBE VALVE #40-A

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STAINLESS STEEL
VALVES AND FITTINGS

GATE, GLOBE, Y, CHECK, ANGLE, SAMPLING AND 3-PORT VALVES
SCREWED AND FLANGED FITTINGS

ALLOY STEEL PRODUCTS COMPANY, INC.

other journals, an understandable move in view of the importance of these journals to industry and export.

Although the outlook in the British Paper Trade is at present not too promising, the future is not being overlooked. Recently a Trade pack was signed between Great Britain and Sweden. The former country hopes thereby to obtain increased quantities of timber, wood pulp and paper in exchange for a wide range of goods including textiles, iron and steel and chemicals.

Possibly the most hopeful sign is the present strength of the various trade associations; the Paper Agents Association recently reported nearly 100 per cent, and the considerable attention being given to the education of the new and younger members of the trade. The Technical Section of the Paper Makers' Association have a very ambitious scheme in hand which has been under discussion for the past two years and has now formulated itself into a panel of instructors covering the country and the compilation of textbooks on papermaking written by recognized authorities which will be followed by smaller brochures treating separate aspects of the industry. There are also courses in foremanship and safety and a comprehensive library of films, slides, illustrations, etc., for the use of lecturers.

A tiny effort towards the conservation of available paper is presented by the British Standards Institute who have recently recommended the production of the greater majority of books in eight standard sizes.

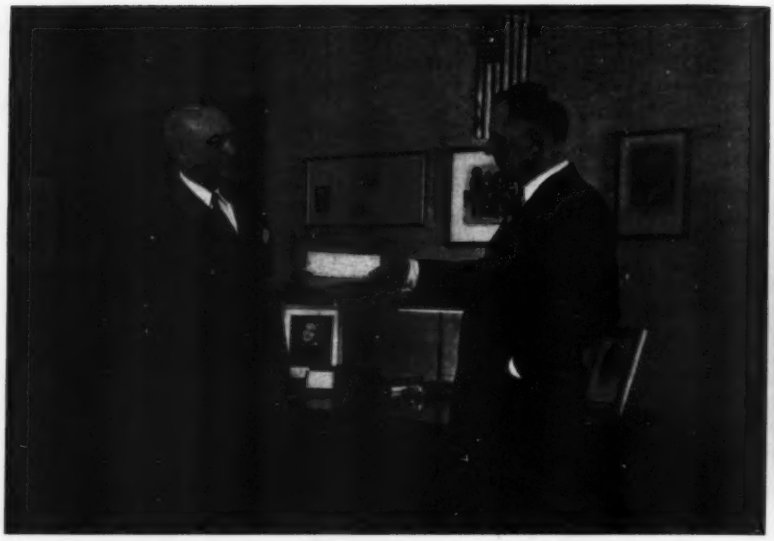
◆

ANNOUNCE NEW PULP MILL FOR DUNCAN BAY, VANCOUVER

Late in December it was announced that a large pulp mill is planned by Canadian Western Timber Company (headed by R. J. Filberg) a wholly-owned subsidiary of Canadian Western Lumber Company.

This plant will be located at Duncan Bay, on Vancouver Island. Size and cost have not been announced, Lands Minister E. T. Kenney states that the Canadian Western Timber Company has applied for a forest management license, which would place its timber supply on a sustained yield basis.

Duncan Bay is about five miles north of Campbell River, site of the province's new hydro plant, which would be able to supply sufficient power for the new mill. This hydro plant, which will be opened shortly, will supply power to the new pulp mill at Port Alberni, which is almost completed.



When Nepco Foundation became an operating charitable corporation, John E. Alexander (right), president and general manager of Nekoosa-Edwards Paper Company, Port Edwards, Wisconsin, presented Walter A. Radke (left), an officer of the Foundation, with a check for $54,000 and the deed to Nepco Court, a new $90,000 eight-apartment building in Port Edwards

NEKOOSA-EDWARDS FORMS CHARITABLE ORGANIZATION FOR PEOPLE OF WISCONSIN

The establishment of Nepco foundation, a charitable corporation to be operated exclusively for religious, charitable, scientific or educational purposes for inhabitants of Wisconsin, has been announced by John E. Alexander, president and general manager of Nekoosa-Edwards Paper Company, Port Edwards, Wisconsin.

Nepco Foundation became an operating charitable corporation Decembe. 5 when Mr. Alexander presented a check for $54,000 and the deed to the Nepco Court, a new eight-apartment building in Port Edwards valued at $90,000, to Walter A. Radke, vice president of Nepco Foundation.

Officers of the new Nepco Foundation are: Mr. Alexander, president; Mr. Radke, vice president; and S. A. Casey, council for Nekoosa-Edwards, secretary-treasurer.

Nepco Foundation in order to carry on its business and accomplish its purpose, has the power to receive contributions of money and property, real and personal, and have all other incidental powers not specifically mentioned necessary to accomplish its aims.

Located in the village of Port Edwards, the Nepco Foundation is organized without capital stock and no part of its net earnings shall, at any time, accrue to the benefit of any private shareholder or any individual member of the corporation, and no dividends or profits shall ever de declared or paid by the Foundation to any person. Membership in the Foundation corporation are individually held and not transferable by the individuals holding them or as parts of their estates.

With Nepco Court incorporating some of the newest and most advanced features in multiple unit dwellings in the country today the debt-free income from rentals represent the first source of regular income to the Nepco Foundation. The Courts beautifully landscaped, are equipped with automatically controlled radiant heating and climate-anticipators which allow for changes in outside temperature before room temperatures drop and many other comfort, safety and convenience appliances.

In addition to the real estate and $45,000 initial contribution from Nekoosa-Edwards Paper Company, Nepco Foundation is assured continued support from the paper company and hopes to receive occasional contributions from others, although no solicitation is planned.

◆

ABANDON LARGE NUMBER OF CASES INVOLVING DUTY ON JAP. PAPERS

During the past month New York importers abandoned fifty-six cases which involved the dutiability of Japanese tissue papers. Some of these cases have been before the United States Customs Court since 1932. In every case the importers had claimed that the imported paper was dutiable at 5 cents per pound and 15 per cent

Here's what your money buys in a NORTHWEST

- **Simplicity of Design**
  —for easy upkeep.
- **Cast Steel Bases with Cast Steel Machinery Side Frames**
  —plenty of strength—assurance of shaft alignment.
- **"Feather-Touch" Clutch Control**
  —easy operation—no fear of shutdown because of control failure.
- **Cushion Clutch**
  —reduces overloads on parts under power when the tongs hang up.
- **Uniform Pressure Swing Clutches**
  —smoother operation—fewer adjustments.
- **Ball and Roller Bearings on all high speed shafts**
  —minimum power loss to friction.
- **Northwest Worm Boom Hoist**
  —boom up, boom down—no jumping, no chattering, just velvet action under power both up and down.
- **Northwest Differential Steering**
  —positive traction on both crawlers while turning as well as when going straight ahead assures easy negotiation of difficult terrain.
- **Crawler Gears fully enclosed**
  —nothing uncovered to pick up trash.
- **Easy Convertibility**
  —all Northwests are easily converted to Shovels—Northwest Dual Independent Crowd utilizes force other shovels waste, making the Northwest a real Rock Shovel.

And your money buys the versatility of a proved, dependable crawler machine. You have a rig that goes anywhere about the mill . . . handles pulpwood, baled waste, cases, rolls, bulk chemicals, bagged or barreled materials, coal, limestone—any and all of the many materials the paper mill must handle. We'll be glad to tell you what other mills are doing. There is a capacity to meet your every problem.

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The Crane that goes Anywhere!

4 to 44 tons

as filtering paper, but the Customs officials had found them to be dutiable either as tissue paper weighing less than 6 pounds per ream at 6 cents per pound and 20 per cent, or as paper cut into shapes at 30 per cent. In every case either rate is higher than that claimed by the importers, and in every case the final duty to be collected will be the higher of these two rates.

According to a report by Warren B. Bullock, manager of the Import Committee of the American Paper Industry, question has been raised as to the classification of paper ordered for delivery on both the Atlantic and Pacific Coast, the issue being whether it is dutiable as printing paper or at the higher rate for Bible paper. The paper weighs 18 pounds, 20x30-480 and because of its opacity and weight is believed by Customs officials at different ports to be Bible paper.

◆

NAT'L CONTAINER CORP. ACQUIRES INDIANA BOX CO.

The National Container Corporation has purchased the corrugated fiber products division of the Martin Brothers Box Company, of Aurora, Indiana, it was announced recently by the officials of Martin Brothers.

This unit will serve the Cincinnati area and surrounding territory, and will constitute the seventh in National Container Corporation's chain of converting plants scattered through the country, all of which are supplied with kraft paperboard by the company's four kraft mills.

NEPCO SALESMEN HOLD 15TH ANNUAL CONFERENCE

The fifteenth annual conference of Nekoosa - Edwards Paper Company sales representatives was held at Port Edwards (Wis.) on November 17.

This conference is held each year for the purpose of discussing merchandising plans for the coming year and to afford Nepco salesmen an opportunity to familiarize themselves with production changes and improvements in company equipment and operations during the past year. Former meetings had been held in December, but the past conference was moved to November to avoid holiday transportation problems.

In the absence of John E. Alexander, president and general manager of the company, Neil E. Nash, vice president, welcomed the representatives. Adam C. Remley, vice president in charge of sales, sounded the keynote of the meetings, following which Charles H. Reese, vice president in charge of manufacturing, conducted the men on a tour of the plant. They were shown through the recently completed bleachery and filter plant at Nekoosa, and were briefed in the operation of these new projects.

One of the sessions was devoted to a discussion of technical and research applications to the sales picture for the future. Dr. T. A. Pascoe, technical director, and Dr. H. W. Rowe, research director, led this session. They were assisted by E. J. Neuberger of the technical department. The company's advertising program for 1948 was outlined by Tad R. Meyer, advertising manager.

Mr. Alexander was present at the closing session. He and Mr. Remley spoke of their satisfaction with the progress achieved through the meetings and extended best wishes to the salesmen for the coming year.

◆

POLYTECHNIC INSTITUTE OF BROOKLYN ANNOUNCES PULP & PAPER LECTURES

Because the increase in the paper industry, which has grown much more than the average industry in the past six years, has not been accompanied by a corresponding increase in technical men, the Polytechnic Institute of Brooklyn will present a second group of 15 lectures in Pulp and Paper Technology beginning February 4. Formerly a one-year course, Pulp and Paper Technology was presented for the first time in 1947 as two distinct one-semester courses.

The lectures, dealing specifically with paper and paper conversion, will be presented by Dr. Robert S. Aries, adjunct professor in the department of chemical engineering, and representatives and consultants of the pulp and paper industries, on Wednesday nights from 6:00 to 8:00 p. m.

Although the industry is producing almost sixty per cent more paper than it produced in 1940, according to Dr. Donald F. Othmer, head of the chemical engineering department, the need for paper is still unsatisfied. Pulp and Paper Technology will stress instru-

Shown here are sales representatives, executives, and supervisors of The Nekoosa-Edwards Paper Company who gathered for the company's fifteenth annual sales conference

Let's Admit It's Simple

The problem of the paper manufacturer *is* simple. It can be posed in two words: *more speed.*

You'll have to count on more than the fast track of a sellers' market to get you under the wire ahead of the field when truly competitive conditions return. Unless your set-up is streamlined for maximum production, you'll literally be left at the post.

Consider, then, the advantages of having Moore & White rejuvenate your equipment . . . and the urgency of getting us started on it *now.*

Call upon us to size-up the component parts of your installation, from Fourdrinier or vat section to lay boy. Get the benefits of the Moore & White enclosed high-speed gear drive. Let us build dramatically increased and perfectly synchronized speed into every step of your papermaking operations. It sounds complicated; but the pay-off is simple—and sure: more tonnage out the door, more profits in the till.

Just write your ticket—double, triple your present output—and toss it into our laps. Our engineers will sweat it out . . . rebuild and modernize your present machines, at a figure considerably under the cost of new equipment.

The MOORE & WHITE Company

15TH STREET AND LEHIGH AVENUE, PHILADELPHIA 32, PA.

CUSTOM-BUILT MACHINES FOR MAKERS OF PAPER AND PAPERBOARD

mentation and automatic control of various pulp and paper operations which will enable plants to produce twice the prewar production with one-third the manpower.

The course will also include the processes for the production of pulp and paper from wood and other fibers, various stages of operation of the pulp and paper mills, with reference to the chemical and engineering aspects of design and operation, and some of the newer processes of coating and combining of papers with plastics. Paper combined with plastics, Dr. Othmer said, produces such articles as trays, the dashboards of cars, and paper bags with a 35 per cent increase in strength.

All types of pulp and paper products, from tissue and cigarette paper to roofing papers, wall board and insulating materials will be discussed. Fine cigarette papers, Dr. Othmer pointed out, were originally imported from France, but United States production has advanced so far that shipments are now made to France.

Offered on the graduate level, pulp and paper technology is open to college graduates and those people in the paper mill industries, or connected with lithographers, printers or the New York technical offices of paper companies, who would like to become acquainted with new developments in the industry.

◆

NEW POWER DEVELOPMENT ON HOLYOKE RIVER OPPOSED BY PAPER MILL COMPANIES

Considerable controversy has developed in Holyoke, Massachusetts, over waterpower rights on the Holyoke River. This conflict has arisen between the Holyoke Water Power Company, which operates a power development on the river which was inaugurated a hundred years ago under state authority. Most of the paper mills in Holyoke draw their power from this company, which in 1944, applied for a license to maintain the power development.

The Holyoke Gas & Electric Department, which derives its managerial powers directly from the state legislature rather than from the city, had petitioned the federal power commission for a permit to conduct a preliminary survey of the river's waterpower resources at Holyoke with a view to obtaining a government license to further develop the river, if the survey should show this to be in the public interest.

This move evoked sufficient interest that a public hearing was held in the Holyoke city auditorium attended by a large company of people including employees and executives of the leading paper mills. The paper mill interests opposed the new development.

Although the measure is still to come before a newly-elected board for 1948, the meeting of Holyoke aldermen on December 16 upheld the Holyoke mayor's veto of an unanimous aldermanic measure which had given the board's sanction to the power scheme advanced by the city department.

◆

THREE RIVERS PLANT OF EDDY CO. TO GET 109" CORRUGATING MACHINE

Last month the Kieckhefer Container Company announced that corrugating machinery will be installed in the plant of the Eddy Paper Corporation at Three Rivers, Michigan. The Eddy company is a unit of the Kieckhefer company.

The plans call for the erection of a new steam plant and other important alterations. It is stated that the new corrugating paper machine, which will produce corrugated paper 109 inches wide, will likely be put into operation by the end of 1948.

◆

CHEMIPULP SUIT AGAINST HUDSON P&P CO. SETTLED

A suit brought in 1943 by Chemipulp Process, Inc., against Hudson Pulp & Paper Corporation, charging infringement of three of Chemipulp's hot acid cooking and recovery patents by reason of operations at Hudson's Kennebec Pulp & Paper Company plant, Augusta, Maine, has been settled.

The settlement provides that, while Hudson denies infringement, the case shall be dismissed and in return for a cash payment to Chemipulp no further claim will be made by Chemipulp as to the operations at the Kennebec mill complained of under the patents sued upon or any patents owned by Chemipulp at the time suit was brought. Hudson is henceforth free to use at the Kennebec plant Chemipulp's patents covering methods and apparatus for hot acid cooking and recovery.

◆

NEPCO MAKES GIFT TO THE VILLAGE OF PORT EDWARDS FOR IMPROVEMENT PROGRAM

A gift of $27,300 was voted to the village of Port Edwards, Wisconsin, at the last regular meeting of the board of directors of Nekoosa-Edwards Paper Company, to be used by the village for the acquisition of real or personal property, or to improve and beautify property so acquired, in connection with the village beautification program.

In the resolution adopted by the board of directors was the provision that, should these special funds not be used for acquisition or beautification of property for any feasible reason, then, upon concurrence of a majority of the members of the steering committee, the sum then remaining in this gift may be expended by the village for exclusively public purposes in construction, ownership and maintenance of buildings for public instruction, recreation or amusement.

Members of the steering committee for the administration of the funds, which will be kept in a separate fund by the village, are John E. Alexander, president of the village of Fort Edwards, Walter A. Radke, Neil E. Nash and S. A. Casey.

◆

$14,000,000 KRAFT PULP & BOARD MILL ANNOUNCED FOR SACRAMENTO, CALIF.

A project estimated to cost more than $14,000,000 has been announced by the Newsom Kraft Company of California. This development will consist of three mills: one will turn out 500 tons of kraft pulp daily; the other will manufacture 500 tons daily of board, and the third 200,000 feet of wallboard. The plant will be located at Sacramento, California.

Partial financing will be provided through a $7,500,000 loan from the RFC. Private capital will make up the remainder.

President of the company is K. K. Newsom, who has been connected with the industry for a number of years.

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▶▶▶ THE FORMATION OF the Committee on Container Research has been announced by Colonel Charles S. Lawrence, commanding officer of the Quartermaster Food and Container Institute for the Armed Forces, Chicago, and George Gelman, technical director. The committee will foster scientific research and training which will provide the necessary technical information and trained personnel for the solution of container problems of the Armed Forces. Dr. James d'A. Clark, consulting engineer, was elected chairman of the newly formed organization.

◆

▶▶▶ INSTALLATION OF a new boiler and fly-ash collector equipment has been announced by the Bemis Bros. Bag Company, Peoria, Illinois. The new unit will conform with the city's smoke abatement ordinance.

Thermalloy and Chemalloy castings ready for inspection in the two X-ray rooms.

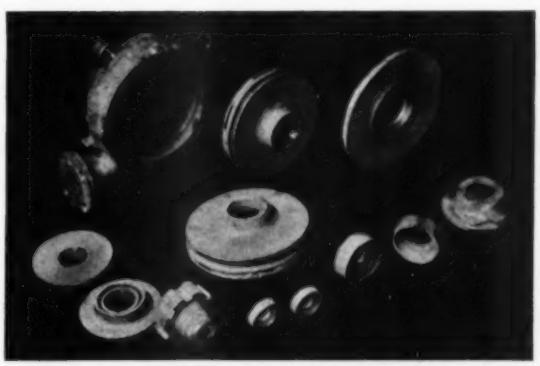
. . . no guesswork here

X-ray pictures *save* you money. When you know a casting is sound all the way through—that there are no hidden flaws—you know it will deliver top performance on the job. And when you buy Thermalloy and Chemalloy castings, you can be *sure* they're sound all the way through.

X-ray is a working tool at Electro-Alloys. It is used constantly to control quality. Before any new patterns are released for production, check castings are X-ray inspected and must meet quality standards. And while a design is in production, samples are X-ray inspected daily to keep quality uniform. All feed pipes, pots, valves, retorts, muffles and similar castings requiring exceptional internal soundness are completely X-rayed before shipment.

X-ray is as important in the production of Thermalloy and Chemalloy as external dimensions. It gives you a complete inside story. There's no guesswork. You *know* the Thermalloy and Chemalloy castings you buy will measure up—inside and out—to your specifications.

WRITE FOR NEW CATALOG. Just off the press. New catalog describing Thermalloy and Chemalloy applications. Write today for your copy. Address Electro-Alloys, Department 12A, Elyria, Ohio.



Chemalloy (18-8 Mo) pump parts. These can be supplied machined or rough.

Thermalloy for heat and abrasion resistance
Chemalloy for corrosion resistance

AMERICAN **Brake Shoe** COMPANY

ELECTRO-ALLOYS DIVISION
ELYRIA, OHIO

BRIEFS

▶▶▶ CONTRACT has been let to the Downingtown Mfg. Company, of Downingtown (Pa.) to rebuild a No. 3 machine of the Newton Paper Company, Holyoke, Massachusetts. The machine will be lengthened 27 feet, an expansion which will require construction of an addition to the machine room. Improvements on the Newton mill's No. 2 machine are now being completed and the company has recently added a new suction extractor.

◆

▶▶▶ A TENANT HOUSE, owned by the Racquette River Paper Company, Potsdam, New York, and used by employees and their families, was recently swept by fire. Officials estimated it would cost between $25,000 to $30,000 to replace the structure.

◆

▶▶▶ DISTRIBUTION of more than 365,000 pine tree seedlings will be made to middle Georgia farmers and agricultural club boys during the winter by the Macon Kraft Company, it was announced recently by D. D. Vickrey, agricultural manager of the Macon Chamber of Commerce. He pointed out the maximum number of slash and loblolly pine seedlings that any one farmer could receive is 5,000.

◆

▶▶▶ NEARLY 2,500 wives and children of Hammermill Paper Company workers visited the Erie (Pa.) plant for the annual Christmas party on December 23. The party has become an institution at the plant, having been started some thirty years ago.

◆

▶▶▶ A SIXTH PAPER machine may be added to the plant of Union Bag and Paper Corporation, Savannah, Georgia. This forecast was made by Alexander Calder, president of the company, in speaking before the Savannah Rotary Club recently. Mr. Calder reviewed the operations of the Savannah plant for the past year and mentioned the big fifth machine which was put into production recently.

◆

▶▶▶ TWO IMPORTANT educational gifts have been made during the past month by the D. S. and R. H. Gottesman Foundation, established by the New York Pulp Company. The Foundation, established as a means of fostering education, presented Upsale University of Sweden with $50,000 to endow a series of lectures on the humanities over a five-year period. The Foundation has made an annual grant of $1,000 to the University of Maine to be used for the encouragement of research, primarily in the paper and pulp field. The first fellowship has been awarded to Hsiang-chu Chun, a candidate for his master's degree in chemical engineering, with a thesis on sulphite waste liquor.

◆

▶▶▶ RECENTLY ANNOUNCED by the Forest Service, U. S. Department of Agriculture, is the publication of Farmers' Bulletin No. 1989, "Managing the Small Forest," a 60-page booklet which presents in a non-technical style, simple rules of good forest management by means of which the owner of the small forest can keep his trees vigorous and productive.

◆

▶▶▶ THE MANUFACTURE of paper motor oil containers in Germany is described in a report now on sale by the Office of Technical Service, Department of Commerce. The report deals primarily with the manufacture of paper tubes, bobbins, and cones for the textile industry.

◆

▶▶▶ COMPLETION OF private financing in the amount of $20,000,000 through the Metropolitan Life Insurance Company and a group of banks has been announced by Rayonier, Inc., New York. Part of the proceeds are being used in payment of the recently announced acquisition of a controlling interest in the Polson Logging Company, Washington.

◆

▶▶▶ GOVERNMENT-OWNED patents covering a device for calculating the board foot volume of standing trees is included in a list of 70 such patents issued recently by the Office of Technical Service, Department of Commerce.

◆

▶▶▶ TWO MILLION seedling trees have been planted on the South Carolina and Texas holdings of the Champion Paper and Fibre Company during the past ten years, the concern announced, in revealing plans for expanding their planting operations. This winter, Champion will plant two million seedlings in Texas, with at least that many more scheduled for planting the following year.

◆

▶▶▶ A JOINT LUNCHEON of the Washington state forestry conference and the Seattle Chamber of Commerce members' council was held December 5. In an address, Howard Morgan, manager of the Longview division of the Weyerhaeuser Timber Company, predicted a bright future for the Pacific Northwest's pulp and paper industry because of technical advances in the industry and the region's favorable conditions for growth of wood supplies.

◆

▶▶▶ A REPLACEMENT program for the four digesters of the St. Helens Pulp and Paper Company at St. Helens, Oregon, has been announced. The firm will spend approximately $100,000 on the project.

◆

▶▶▶ A DIVIDEND, the first since 1928, will be paid by the A P W Products Company of Albany, New York. Dwight G. W. Hollister, president, announces that the board of directors has authorized payment as of January 19 of a 12½ cents per share dividend on common stock.

◆

▶▶▶ AN AGREEMENT on a new plan for abatement of Androscoggin River pollution has been reached by the State of Maine and three big pulp and paper firms. The plan calls for construction before next June 15 of a 22,000,000-gallon reservoir at Jay, Maine, to hold waste liquors from the manufacture of sulphite pulp. Costing an estimated $150,000, the reservoir will be financed jointly by the Brown Company of Berlin (N. H.), the Oxford Paper Company of Rumford, Maine, and the International Paper Company, Livermore Falls, Maine.

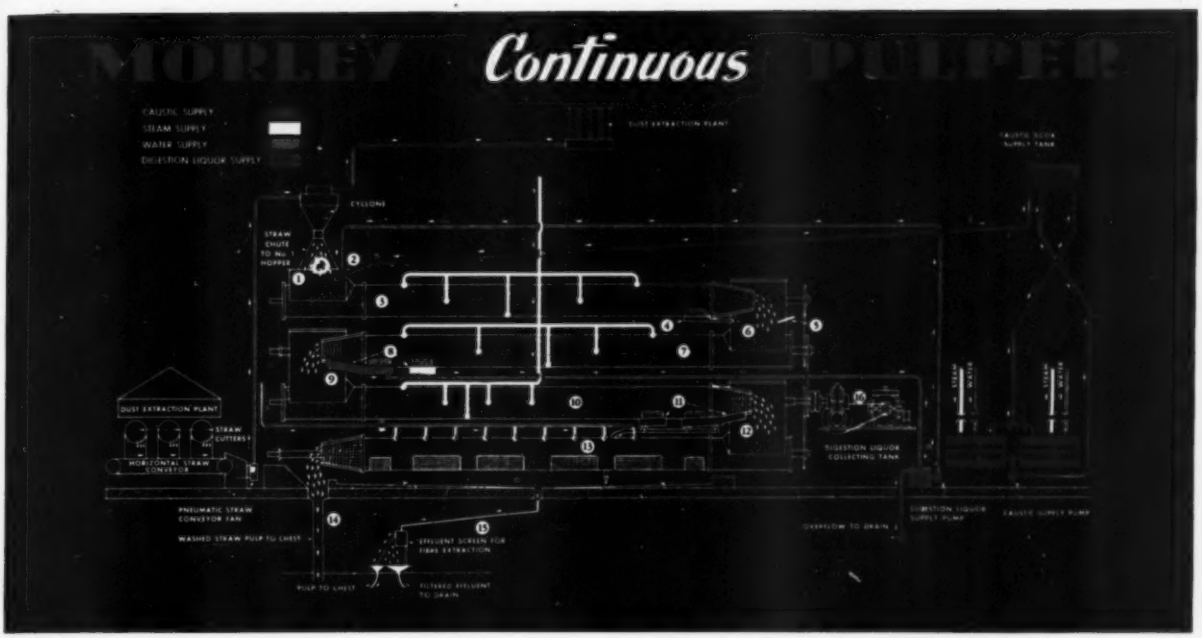
◆

▶▶▶ SEVERAL HUNDRED employees of the Continental Paper Company, Ridgefield Park (N. J.), are now participating in organized athletics and social programs sponsored and directed by the Continental Athletic Association which was formed earlier this year.

◆

▶▶▶ A FORMAL STATEMENT has been issued by Anthony Gaccione, president of Toga Paper Stock Company of New York, that the supply of wastepaper in 1948 will be far greater than that used in 1947. He estimates an increase to 8,000,000 tons as compared with 7,000,000 tons in 1947, and forecasts an accompanying leveling off of prices. He expects that the wastepaper will be a better grade than that which found its way to the market before the war, crediting this change to the improved quality coming from the manufacture of bleached kraft in the South.

MORLEY Continuous PULPER



PATENTED AND PATENTS APPLIED FOR

for continuous pulping of Cereal Straws, Bagasse, and the like

The MORLEY CONTINUOUS PROCESS AND APPARATUS, now in mill operation for five years, is a proven efficient method, operating at atmospheric pressure only. It economically and continuously processes cereal straws and other cellulosic materials to pulp for the ultimate manufacture of quality paper and/or Board, for example: .009 Corrugating, Tube Stock, Wall Board, and many grades requiring rigid characteristics.

- Continuous Feed and Digestion at high density.
- Operates at atmospheric pressure and low temperature.
- For .009 corrugating and board grades, average yields 69-70% based on straw, as used, averaging 12% moisture.
- Low steam consumption.
- Low overall power consumption.
- Digestion period is approximately 20 minutes for .009 corrugating or board grades. This insures minimum degradation of finer fibres, and reduces shrinkage.
- Space required for one 50-ton Unit is 7,000 cubic feet, a saving of approximately 65% over conventional equipment.

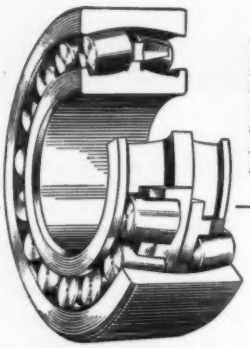
Write for Morley Brochure

KEY TO FLOW DIAGRAM:

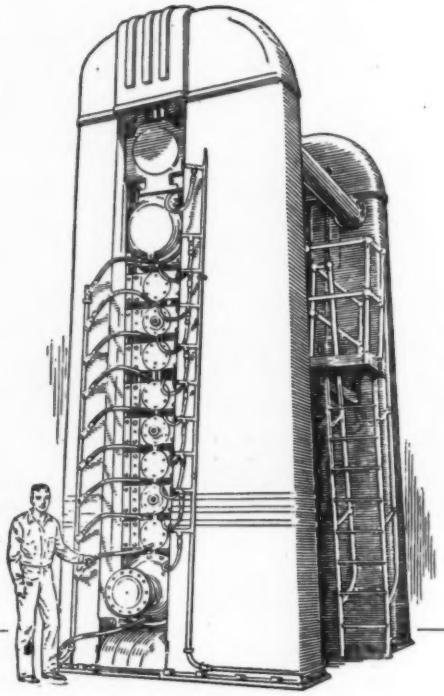
1 No. 1 Tube Hopper
2 Caustic Soda Orifice metering system
3 No. 1 Tube Impregnator
4 Screen Plate and Drainage Line for Digestion Liquor to No. 2 Tube
5 Recording Thermometer
6 No. 2 Tube Hopper
7 No. 2 Tube Digester
8 Screen Plates and Drainage Line for Digestion Liquor to Collecting Tank
9 No. 3 Tube Hopper
10 No. 3 Tube Digester
11 Screen Plates and Drainage Line for Spent Liquor to Drain
12 No. 4 Tube Hopper
13 No. 4 Tube Washer
14 Washed Straw Pulp to Chest
15 Spent Liquor Supply to Effluent Screen
16 Motor, Texrope, and Reduction Gear Drives

PAPER and INDUSTRIAL APPLIANCES, INC.
122 EAST 42nd STREET NEW YORK, N. Y.

You get better caliper and finish with Torrington Spherical Roller Bearings



The Appleton Supercalender Stack, made by Appleton Machine Company, Appleton, Wisconsin, is one of the first to incorporate the advantages of Torrington Self-Aligning Spherical Roller Bearings on intermediate rolls. Specially designed straight and tapered roller Torrington Bearings are used on top and bottom rolls.



... one of the many advantages for Paper Industry is the self-aligning precision design of this Torrington Bearing.

BETTER caliper and finish are only two of the advantages gained by eliminating roll crowding and maintaining constant roll alignment on supercalenders equipped with Torrington Self-Aligning Spherical Roller Bearings. The low coefficient of friction and closely held precision tolerances assure smooth starting and dependable operation, help cut losses from snap-offs and decrease power requirements. Rapid roll changes are possible because no alignment adjustments are necessary. High radial capacity and two-directional thrust capacity result in long service life.

These are typical of the many advantages you can get on your beaters, chippers, Jordan engines, screens, paper dryers and calenders by ordering Torrington Spherical Roller Bearings on new equipment, for rebuilding or replacement needs.

With many years of experience in designing and building all major types of anti-friction bearings, Torrington engineers will welcome the opportunity to assist you on any bearing requirement. Call or write the nearest Torrington office.

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TORRINGTON BEARINGS

SPHERICAL ROLLER
TAPERED ROLLER
STRAIGHT ROLLER
NEEDLE
BALL
NEEDLE ROLLERS

A new kind of Fitting

—A complete line, including ELLS—TEES—CROSSES—RETURN BENDS—"Y's"—LATERALS—FERRULES—REDUCERS—ADAPTERS

for Stainless Steel light-gauge tubing . . .

CORROSION-RESISTANT
QUICKLY INSTALLED
LOWER COST
LESS FRICTION
LEAK-TIGHT
SIMPLE UNIONS
READILY ADAPTABLE TO OTHER FITTINGS

. . . TRI-CLOVER Conical End Fittings

—a new kind of fitting, bringing even greater benefits from the use of light-gauge tubing, for all types of industrial applications where conveying lines require corrosion-resistant properties.

Fittings are fabricated from type 316 stainless steel. Line connections are made with simple, leak-tight flanged couplings (as illustrated)—designed for working pressures up to 250 lbs. per sq. in. Adapters permit use of TRI-CLOVER fittings with a variety of other types, including IPS fittings, conical glass tubing, and welding fittings.

Available for commercial tolerance stainless steel tubing having outside diameters from 1" thru 10".

Tri-Clover
MACHINE CO.
Kenosha, Wisconsin

TRIALLOY AND STAINLESS STEEL SANITARY FITTINGS, VALVES, PUMPS, TUBING, SPECIALTIES

FABRICATED STAINLESS STEEL INDUSTRIAL FITTINGS AND INDUSTRIAL PUMPS

THE Complete LINE

Ask about . . .

Zephyrweld
STAINLESS STEEL WELDING FITTINGS
for permanent installations

Available in a complete line, in sizes from 1" O.D. through 24" O.D., fabricated from stainless steel type 304, 316 or 347*.

No mitre joints—sweep ell design—no internal threads or pockets—joints are flush.

*Above 4" only 316 or 247.

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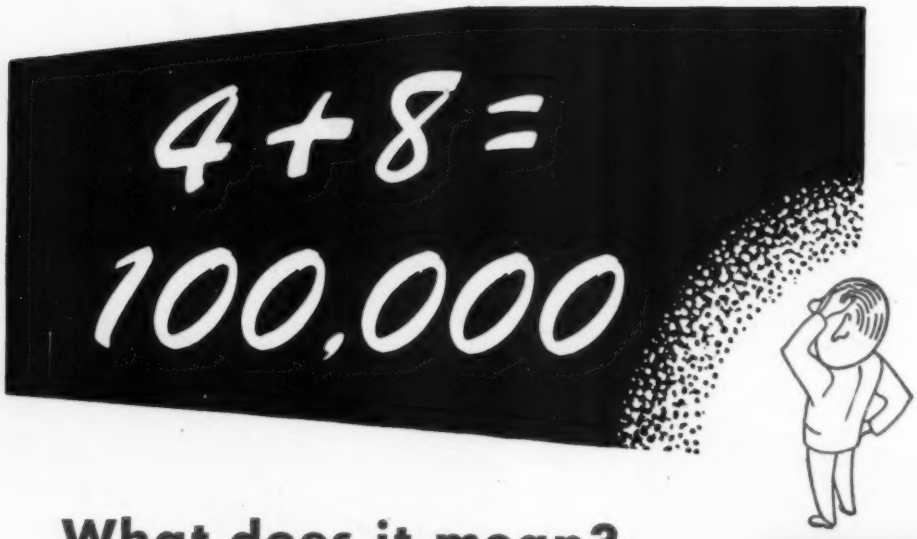

What does it mean?

Just this—with 4 basic circuits and 8 basic component parts you can get over 100,000 different combinations of Bailey electronic instruments and controls for flow, temperature, level, speed, gas analysis, etc. Furthermore, parts are interchangeable.

Look how this simplifies your instrument problem. By specifying Bailey, you automatically reduce your stock of replacement parts. You begin to standardize your instruments as you do other equipment in your plant. And that means reduced maintenance costs.

Maintenance men need less training—they quickly become familiar with the standardized Bailey parts—no time is lost in exploring a multiplicity of specialized equipment. For example—the amplifiers, slidewire units, and other basic components are standard for all combinations of Bailey electronic instruments.

Write today for bulletin 17. You should have a copy in your file for ready reference the next time you specify process controls. Meanwhile, remember—4 plus 8 will give you over 100,000.

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Save 3/4
OF YOUR PANEL SPACE

This is typical of the advantages you get with Bailey instruments and controls. The 4-pen Pyrotron makes the same number of continuous records as four separate recorders. Each pen is actuated by a separate system. It draws a continuous record in a distinctive color. Package units are interchangeable. Our bulletin 230-A describes this space-saving unit in detail.

P-13

BAILEY METER COMPANY
1058 IVANHOE ROAD
CLEVELAND 10, OHIO

YOU GET MORE WITH A *Sutherland*

THAN JUST A REFINER

When you purchase Sutherland Continuous Beaters and Refiners or the Sutherland High Yield Sulphate Process, you get the necessary engineering service to plan the layout for the best results in your mill, plus technicians at the start-up to properly train your operations and maintenance personnel; PLUS continuous service to keep your operations abreast of new Sutherland developments. . . . Quick attainment of performance guarantees is easily accomplished by your regular operating crews; in addition, your satisfaction with the entire installation is guaranteed. We will not accept any orders unless we are sure the results will add to the good reputation we have been building for twelve years. . . . Regardless of whether you make bond, book, news, kraft, tissue or board, your conditions will be improved with Sutherland Refiners operating ahead of your papermachines. . . . May we send you our new catalog, or may we answer your specific questions by mail or a visit?

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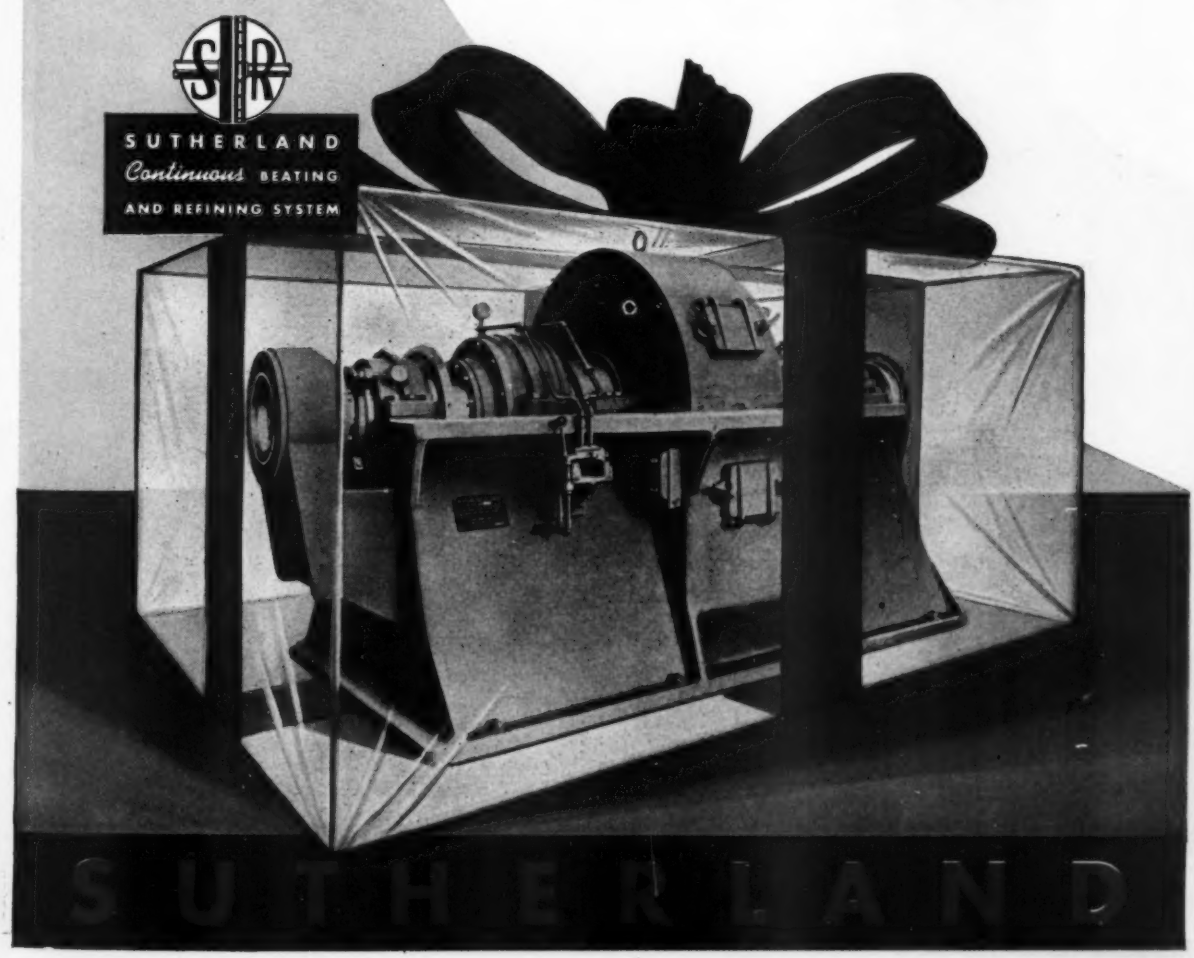
SUTHERLAND REFINER LIMITED, 319 DRUMMOND BLDG., MONTREAL, P. Q.

Manufactured in Canada by The John Bertram & Sons Co., Ltd., Dundas, Ontario



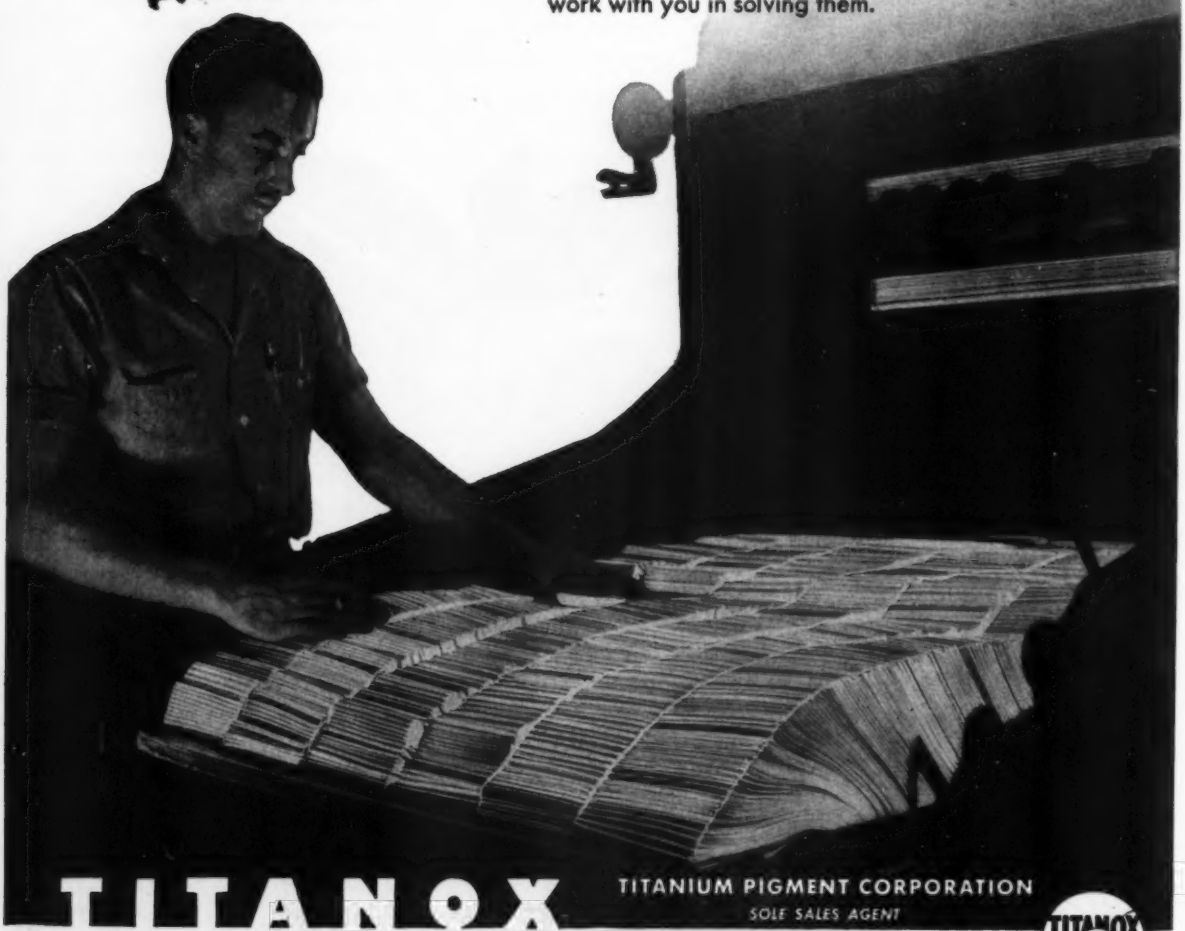
TITANOX . . . *the brightest name in titanium pigments*

Your paper is MORE OPAQUE, WHITER and BRIGHTER WITH TITANOX PIGMENTS

*M*anufacturers of all types of white, bright and opaque paper always find that TITANOX pigments generously contribute these qualities to their stock.

Printers prefer paper made with these famous TITANOX pigments. You, in turn, can be sure of a product that looks better . . . prints better . . . *sells* better when you use the TITANOX line.

While the supply of TITANOX, unfortunately, is limited, we can still be of help on any pigmentation problems you may have. Our Technical Service Laboratory — reached through our nearest office — will be glad to work with you in solving them.



TITANOX

Reg. U. S. Pat. Off.

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SOLE SALES AGENT

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104 So. Michigan Ave., Chicago 3, Ill.
350 Townsend St., San Francisco 7, Cal.
2472 Enterprise St., Los Angeles 21, Cal.

6216

Time for Changing—

Paper mill felts need changing, too. Hamilton Felts will do your work better, faster and at lower cost.

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Miami Woolen Mills

Hamilton Felts

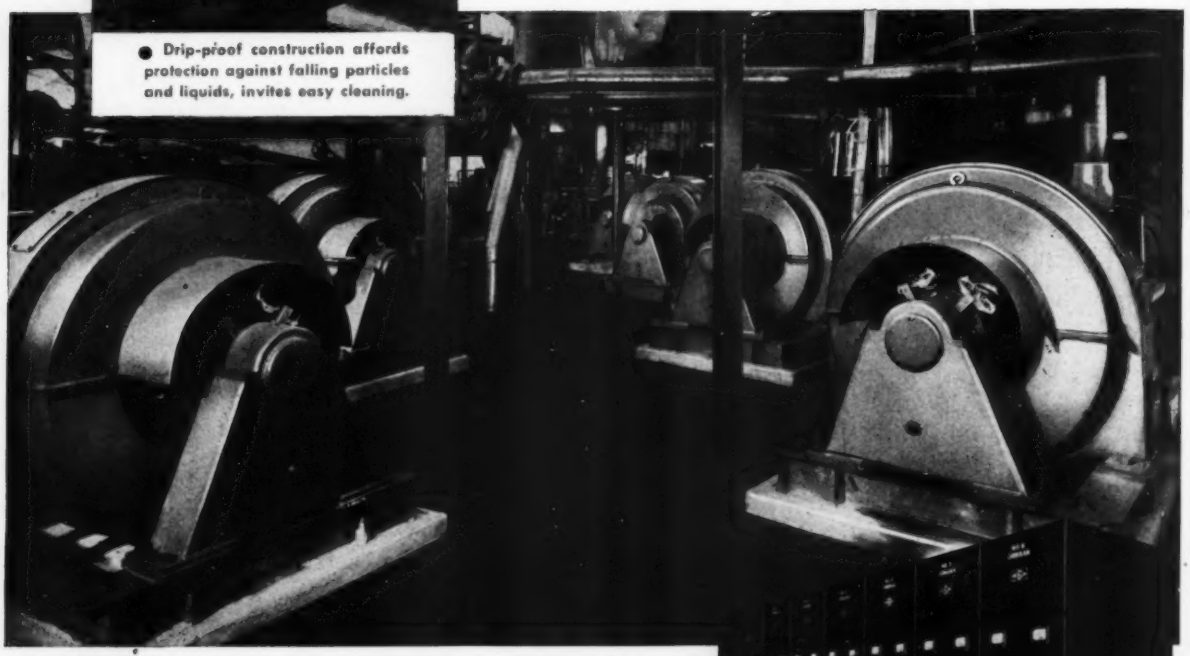
Established 1858

Nine More

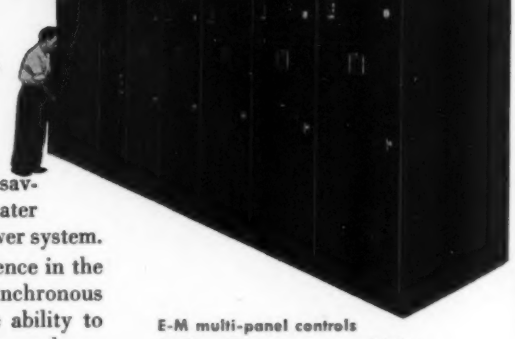
E-M SYNCHRONOUS MOTORS

AT RIVER RAISIN PAPER CO.

● Drip-proof construction affords protection against falling particles and liquids, invites easy cleaning.



WITH **E-M** PRE-ENGINEERED CONTROLS



E-M multi-panel controls at River Raisin are completely enclosed, in keeping with modern trends.

Nine more E-M Synchronous Motors, directly coupled to Jordans, have been installed at the River Raisin Paper Company, Monroe, Michigan.

Originally River Raisin installed two 0.8 pf E-M Synchronous Motors. Later a third E-M motor, SPLASH-PROOF design, also 0.8 pf, was added. The recent installation of nine DRIP-PROOF, unity pf, 250 hp, 450 rpm synchronous motors is pictured above. Repeat business like this is the best indication of the ability of a product to perform satisfactorily.

E-M Synchronous Motors are also highly advantageous for many large, heavy-duty drives like CHIPPERS, GRINDERS, PULPERS, PUMPS, AIR COMPRESSORS . . . high efficiency and power factor correction obtainable with synchronous motors mean savings in power costs and greater efficiency in the plant's power system.

E-M offers a rich experience in the design and application of synchronous motors, together with the ability to provide complete pre-engineered systems of motors and controls designed to meet the job requirements. E-M offers you a single responsibility in the design and manufacture of motors and controls.

● Power enters at 440 volts; a 25,000 ampere interrupting capacity air circuit breaker in the upper panel of each Jordan control provides short-circuit protection and serves as a disconnecting switch.

This combination of E-M PRE-ENGINEERED controls and E-M Synchronous Motors makes the Jordan installation a smoothly functioning part of the power system. E-M controls feature E-M's famed PFFR* for "CONSCIOUS CONTROL" which assures correct trouble-free starting and protection for the motors.

** Polarized Field Frequency Relay—An exclusive E-M feature for the automatic application of motor field excitation to insure proper synchronizing with minimum line disturbance.*

ELECTRIC MACHINERY MFG. COMPANY • **MINNEAPOLIS 13, MINNESOTA** A2050

The Way Is Straight For Forty-Eight

▶▶▶ INFLATION AND HOW to lick it will be the No. 1 problem of 1948. It is encouraging to note that we have come into the New Year with a better, wider, and expanding knowledge of what inflation is. The industrialists have defined it as the excess supply of money wanting to buy a deficit supply of goods.

Hence, the No. 1 Remedy is to increase production of goods and stabilize the present buying power.

The No. 2 Problem is to bring our excessive expenses down below our income receipts.

These are the two best ways in which to correct our inflationary spiral: (1) Supply our people with plenty of commodities; (2) Curtail our expenditures below our income.

That industry recognizes the truth of these postulates, a review of the production records in the United States for 1947 gives ample proof. Every major industry in this country is making and breaking peacetime—even wartime production records.

For instance, steel closes the year at 97.8 per cent of capacity. The total for the year will approximate 84,000,000 tons despite strikes, shutdowns for repairs, shortage of scrap, and other interferences. This total was only slightly topped by the war years 1943 and 1944. However, with the increase in capacity coming this year, steel's total will exceed all-time production records.

Another instance is the paper industry, the domestic production of which will approximate 22,000,000 tons showing at least an 8 per cent increase over 1946. This industry is running at 100 per cent capacity increasing its production in the face of growing shortages of raw materials and handicaps never before envisioned.

The question of increased production from now on is limited to the increase in wood pulp capacity. Wood pulp capacity is not and cannot be installed fast enough to catch up with the constantly increased demand from population increase and expanded end use requirements.

The present production of cultural papers is reaching the point of saturation by the augmented use of repulped wastepaper. They must have constant increases of live wood pulp to maintain quality. The industrial paper demand calls for papers made from virgin wood pulp only. Strength and pliability are the essentials in those grades, and virgin wood pulp is indispensable to their augmented production.

Increases of wood pulp capacity are slow, costly, and limited to locations of accessible pulpwood areas. Consequently, the continued expansion of total tonnage of boards and paper comparable to the increases of 1946 and 1947 are not to be expected.

The balancing of supply to demand in the paper economy is not yet in sight. Nineteen forty-eight will be another big profitable year for the paper industry, particularly for those integrated mills which control pulpwood areas sufficient to cover their capacity requirements.

The paper industry will deliver its quota of increased production as the other divisions of industry also will do, and as they all did to win the war. To lick our enemy, *inflation*, we shall again furnish the production to do the job, in spite of every political or economic obstacle.

Faith

We walk by faith, not by sight.
—BIBLE

◆

Let us fear the worst, but work with faith; the best will always take care of itself.
—VICTOR HUGO

◆

There are no tricks in plain and simple faith.
—SHAKESPEARE

◆

Faith makes the discords of the present the harmonies of the future.
—ROBERT COLLYER

◆

Faith is the substance of things hoped for, the evidence of things not seen.
—BIBLE

◆

Without faith a man can do nothing. But faith can stifle all science.
—AMIEL

◆

The steps of faith fall on the seeming void, and find the rock beneath.
—WHITTIER

◆

Works without faith are like a fish without water, it wants the element it should live in. A building without a basis cannot stand; faith is the foundation, and every good action is as a stone laid.
—FELTHAM

◆

Strike from mankind the principle of faith, and men would have no more history than a flock of sheep.
—BULIVER-LYTTON

◆

Faith is the backbone of the social and the foundation of the commercial fabric; remove faith between man and man, and society and commerce fall to pieces.
—THOMAS GUTHRIE

◆

Let us have faith that right makes might; and in that faith, let us, to the end, dare to do our duty as we understand it.
—ABRAHAM LINCOLN

◆

He had great faith in loaves of bread
For hungry people, young and old,
And hope inspired; kind words he said
To those he sheltered from the cold.
In words he did not put his trust;
His faith in words he never writ;
He loved to share his cup and crust
With all mankind who needed it.
He put his trust in Heaven and he
Worked well with hand and head;
And what he gave in charity
Sweetened his sleep and daily bread.
—ANONYMOUS

CURRENT THOUGHT

Some Observations on the New Year

WILLIAM SIBLEY

▶▶▶ SINCE LONG BEFORE Time became immemorable, the advent of a New Year has brought out of hiding a handful of prophets who dash madly to the Forecaster's Bar, imbibe three thumbs of wild cow's milk, then clamber aboard the Good Word Royal and give forth sombre warnings of lugubrious things which, to them, seem portentous.

This New Year is no different, except perhaps there is a larger percentage of editorial foresighters who view events with alarm and warn us of the necessity for making momentous decisions. The thought "This is the year for decisions," has been the theme of more editorials and economic articles this year than in any other calendar year in recent history. And that is quite a lot to say when economists and editors make their living by jumping from crisis to crisis.

The more one reads of the various prognostications, the more he is confused. At the point where the reader is struggling to keep his understanding in balance, that life-saving sense of humor sets in and because opinions differ so widely, he is able to retain his own powers of reasoning—he even gets a real kick out of one writer setting forth dire predictions, while another thinks those forecasts are just what the doctor ordered.

While Moscowian Russia insists "the Marshall Plan is a capitalist plot to break up the workers," here in the United States the "workers" have given it warm support. Wallace scares the Truman Democrats to tears by announcing his candidacy for the presidency. Since, then, it seems fashionable to predict, who am I to deny myself that pleasure, and you the chance to scorn my judgment?

▶▶▶ For most of the white race the annual day just passed marks the Anno Domini year of 1948. For the new Palomar telescope, it is a couple of trillion years. For the Japanese it is the twenty-third year of Showa, dating to Hirohito's accession. For the Chinese the new year will not begin until February 10, and then it will be the Thirty-eighth of the Republic. For Moslems, this is the 1,367th year of Mohammed. For orthodox Jews, the year 5708 has eight and one-half months yet to go. For the followers of Buddhism, it is the year of 2198. (When it is realized that there are between 125-150 different sects within the Christian religion—who can be so naive as to look for, even hope for, the "unification of the Church" at any time short of another thousand years or so.)

▶▶▶ Getting a little closer home, and to things more realistic, as well as to things which get my neck out farther:

Nineteen forty-eight should be a very good year for farmers. Certainly with the world-at-large in need of food of all sorts (from that of the stomach to that of the cannon) there will be no surplus problem. If the Government continues to subsidize the farmers for *not* growing wheat, corn, or oats (then let them use the land for soy or clover or flax), it will be plain out-and-out vote-buying (which it has been in the past). Some folks who should know what it is all about say there will probably continue to be a meat shortage, although for us who are not in a position to know anything—wonder why!

In the field of therapeutics, science tells us that 1948 will most likely bring us heartening news about developments in the fight against cancer. Welcome! They say, also, that the flu may be through—or as "through" as the bubonic plague or typhoid. Doubly welcome!! Now—how about the common cold?

During the next twelve months there doubtless will develop a full-scale fight against the Taft-Hartley law at the hands of labor. The fight already has begun in several places, notably the compositors on Chicago newspapers. Labor will see to it that strikes reinforce their efforts. In the realm of labor, there is an inevitable third round for wage increases. With people already rebelling against high prices, demand for still higher wages has a much lower chance to win.

A lot of gals (and men) are vociferously opposing the "new look" of the long dresses and other feminine styles. These objections will banish rapidly when the present wardrobes are worn out.

"Yours truly" would be most pleased—and slightly surprised—to see an all-Boston world series next fall. Brother! Wouldn't that be somethin'—and history! Go to it, you Sox and Braves—and attention Parker House, please—reserve for me one double room for that week. I surely would be there! (But the series probably wouldn't be more than five games, if that.)

▶▶▶ When it comes to overseas policies, it is largely a matter of educating our own selves regarding our own strength before getting intelligent commitments or resolution. As a nation, we do not realize our own strength, let alone comprehend our world position. When we realize our own economic power and position; when we realize the crumbling state of our former parent, England; when we add the famous error of commission to the late past President's "Four Freedoms," and join thereto "Freedom of Enterprise"; when we realize that we were the first to think up an ideal of the five freedoms and then build a world dominating state around them; when we realize that we are the white hope of order for the entire world—then will we realize that a few billions of dollars, more or less, expended in the right direction, will be the greatest bargain we could make in all history, not only for ourselves, but for all mankind.

Withdrawn

what the paperboard industry sees in

CMC

HERCULES

A YEAR AGO we asked the industry, "What do you see in CMC?" Today, paperboard manufacturers—among the first to explore the possibilities of this new chemical material and to recognize its value—have found that:

Hercules® CMC gives paperboard added internal and surface strength!

Hercules CMC gives paperboard added resistance to penetration by oils and waxes which, in turn, promotes higher quality gloss ink printing, ink economy, and wax savings!

Although full-scale production was not begun until just a year ago, when Hercules introduced CMC to the paper industry, this new cellulose gum has been under investigation at Hercules Experiment Station since 1944. Therefore, Hercules CMC is the result of continuing research and long-time production experience.

Hercules CMC—the sodium salt of carboxymethylcellulose—is a free-flowing, white, water-soluble, granular powder, supplied in 100-lb. cartons. For prices and delivery data or for detailed technical information, mail the coupon today.

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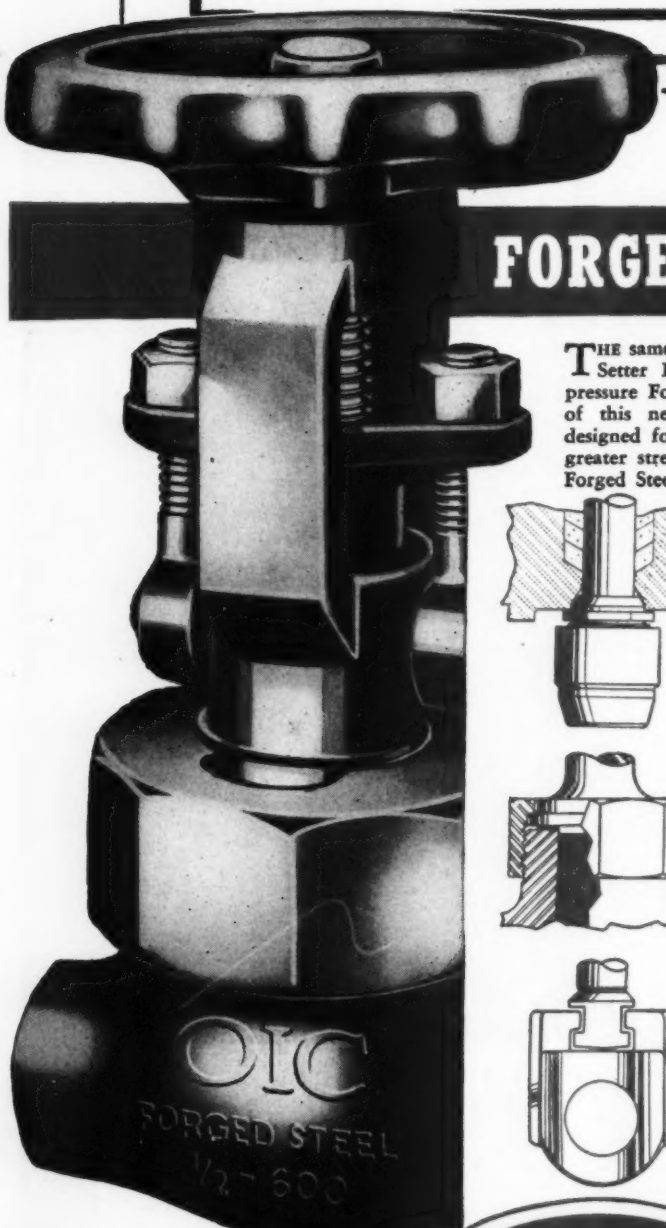
OIC

PACE-SETTER IN VALVES

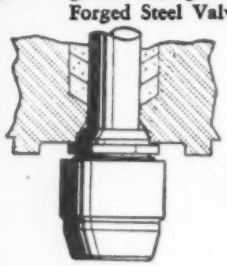
Announces

A NEW LINE OF

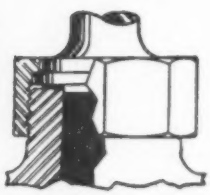
FORGED STEEL VALVES!



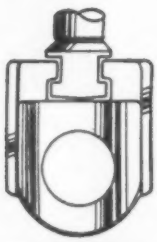
THE same superior quality that earns OIC the title of "Pace-Setter In Valves" is now available in OIC 600-pound pressure Forged Steel Valves. You'll find bodies and bonnets of this new OIC line precisely machined from carefully designed forgings . . . ample wall thicknesses maintained for greater strength and safety . . . in all types and sizes, OIC Forged Steel Valves exceed the accepted standards.



Mirror-like finish on mating back seat surfaces insures a positive, leak-proof seal when the valve is in the full open position. This handy feature permits complete removal of the packing without disturbing the flow and without danger of leakage and injury to the operator.



The stout union bonnet ring is machined from rolled steel. The octagonal design provides a greater number of wrench-grip positions and maintains ample cross-sectional area for maximum strength without excessively protruding corners. All bonnet studs and nuts are of heat-treated material — another OIC quality feature.



OIC Forged Steel Gate Valves are provided with a rugged T-head-and-slot connection between stem and disc. This connection is accurately machined to close tolerances with proper clearances allowing the disc to adjust itself to the seats without binding, thereby insuring long, dependable, trouble-free service.

New OIC FORGED STEEL
VALVE CATALOG No. 48FS NOW READY

It's made to fit inside your big 248-page OIC Catalog. You'll have *all* the valve information you need right at your fingertips. For your free copy, just write, giving your name, firm, and address to The Ohio Injector Company, Wadsworth, Ohio.

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OIC VALVES

STEEL • IRON • BRONZE

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ARE ALWAYS A GOOD SPECIFICATION

- **SODA ASH**
- **CAUSTIC SODA**
- **LIQUID CHLORINE**
- **SILICATE of SODA**

DIAMOND ALKALI COMPANY
PITTSBURGH 22, PA. and EVERYWHERE

Impco FLAT SCREENS

Here are a few pictures of a recent Impco installation at West Virginia Pulp and Paper Company's plant in North Charleston, South Carolina. Special attention is given to keeping air out of the stock thus promoting faster screening and thickening.

The new Impco Flat Screens are designed for getting the most from any bronze or stainless steel plate. Look for:

- *Rigid Cast Bronze Vats*
- *Silent adjustable, positive stroke, eccentric drive—anti-friction bearings*
- *New replaceable bevel plate fasteners*
- *Higher capacity with extra large outlets*
- *New plate-end fastenings—eliminating wood sealing strips*

Let us work with you to achieve higher capacity, finer quality.

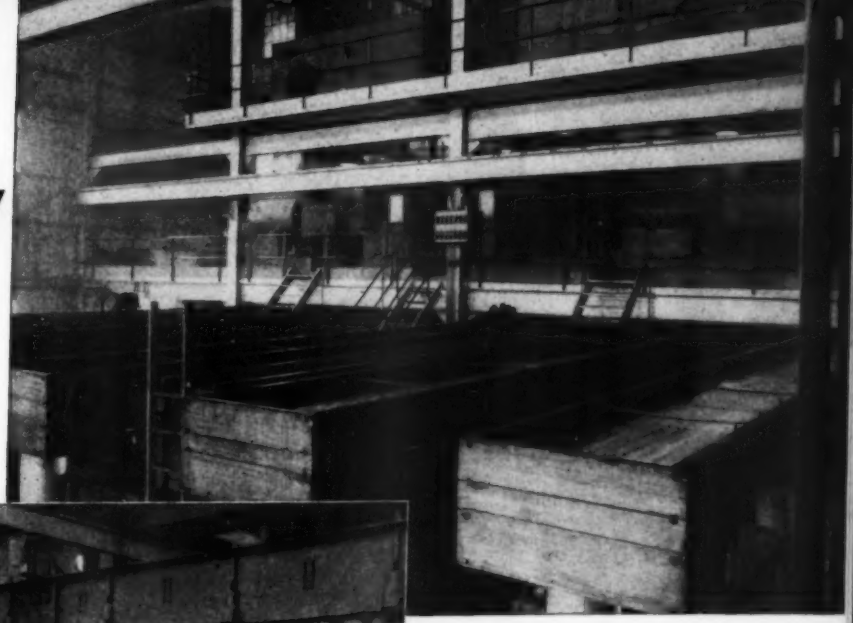
Improved Paper Machinery Corporation

NASHUA, NEW HAMPSHIRE

A-12

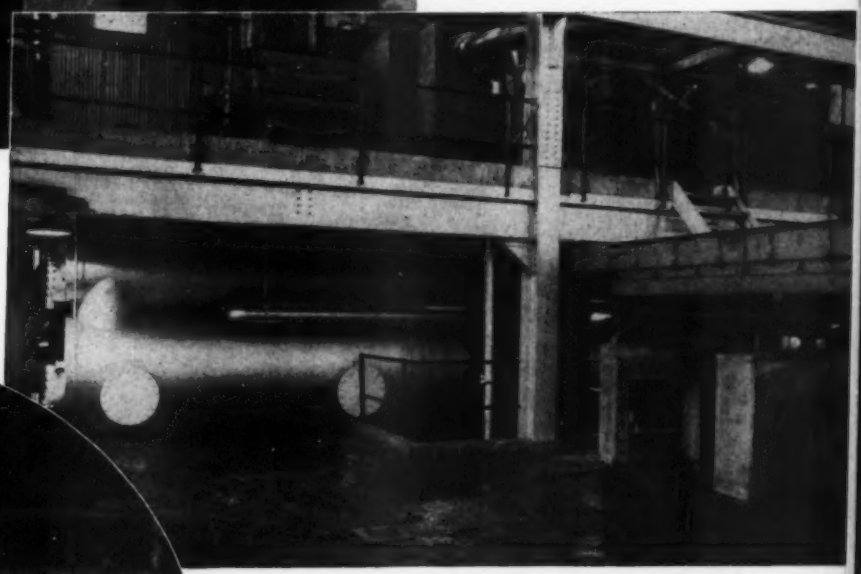
⇩ *Screens and Vacuum Deckers. Piping is below floor*

..for Higher Capacity ..for Finer Quality

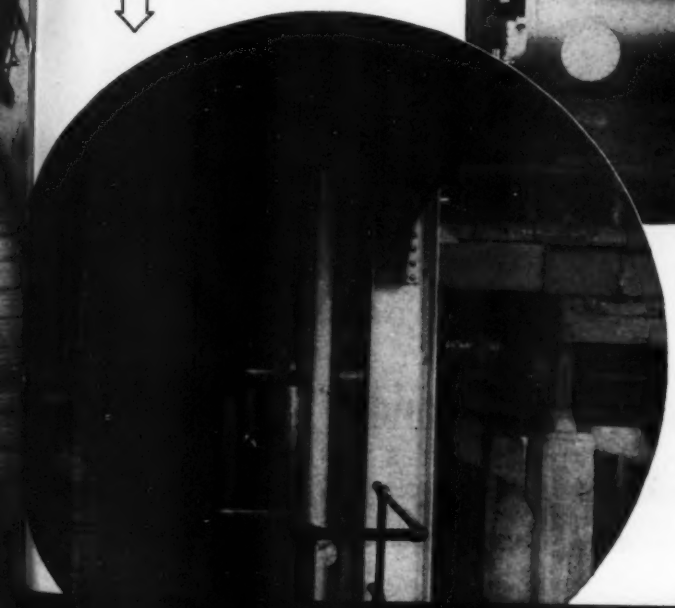


Two Stock Volume Meters with Consistency Regulators govern steady flow through Impco Knotters and Screens

Bronze Vat Screens, two per line mounted for easy maintenance



Pressure Stock Headers with Submerged Inlets and "Forming Aprons" for uniform distribution to Screens



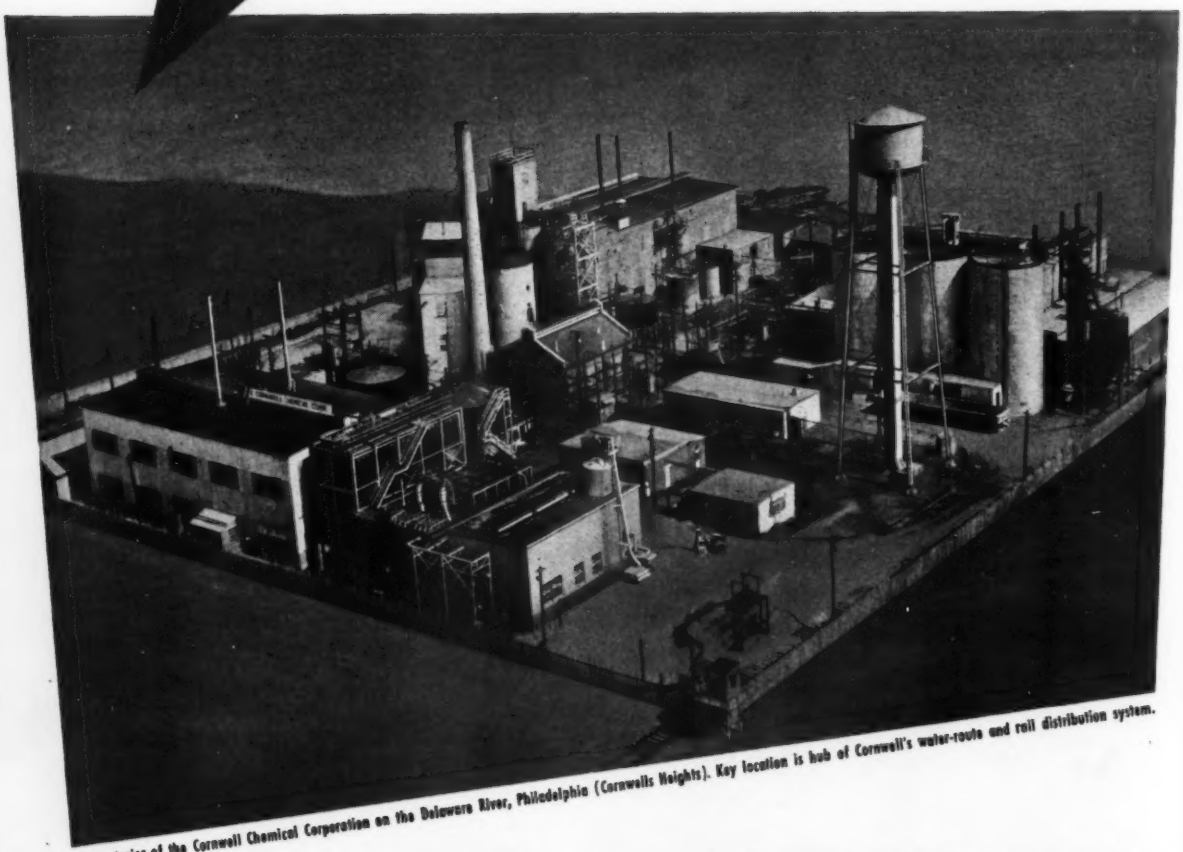
"From Cooking to Use"

IMPCO

Pulp Mill Equipment

SALT CAKE

.....paper makers' grade



Plant and Laboratories of the Cornwell Chemical Corporation on the Delaware River, Philadelphia (Cornwells Heights). Key location is hub of Cornwell's water-route and rail distribution system.

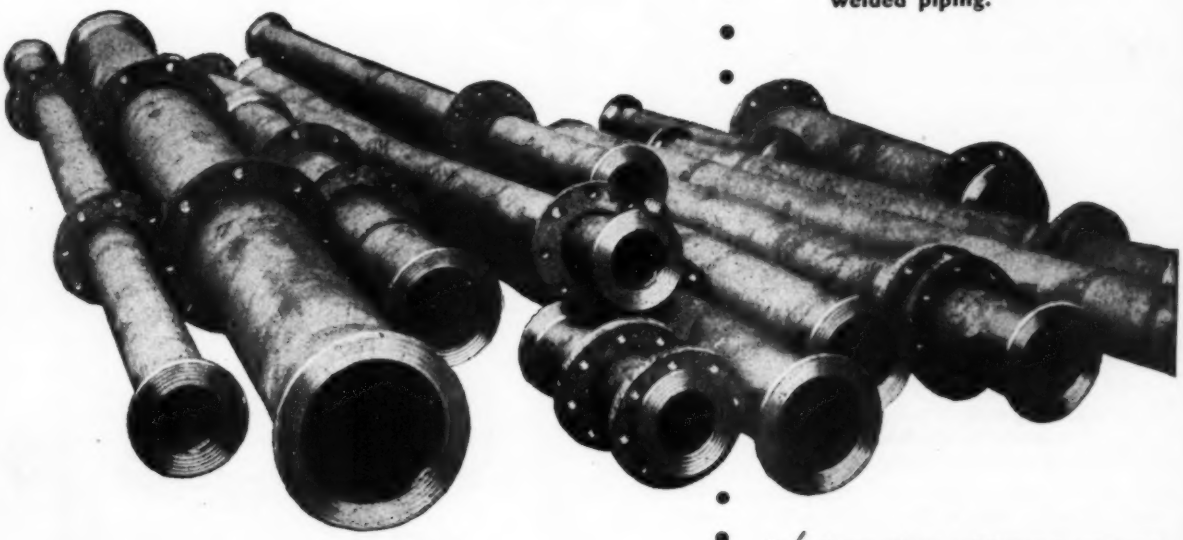
Cornwell Chemical Corporation

CORNWELLS HEIGHTS (PHILADELPHIA), PA.

Telephone: Torresdale (Phila.) 4-7358 Cornwells 0302 Cables: SEECHEM

Piping for Profit

with *ESCO Spuncast* pipe



THE THREE BOGEY MEN in piping systems are corrosion, pressure and vibration. Lick them by installing *ESCO Spuncast* pipe. Productive work hours will increase, shutdowns and maintenance expense will hit bottom.

ESCO Spuncast pipe is centrifugally cast of stainless steel—and there's no question about its ability to resist corrosion. We have prepared a complete study showing corrosion resistance against a wide variety of acids, alkalines, salts, gases and temperatures. A copy should be of value to you, and is yours for the asking. Please use the coupon or write.

- ✓ **Superior corrosion resistance through range of alloys not available in seamless or welded piping.**
- ✓ **Strength to withstand pressure and vibration.**
- ✓ **Long life—low maintenance.**
- ✓ **Sizes range from 2-in. IPS through 14-in.**
- ✓ **Can be produced to special diameters which may be required.**

FREE CORROSION CHART...mail coupon

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For faster, better piping jobs get everything from CRANE

An all-Crane installation! That's a sure way to keep piping jobs moving swiftly and smoothly—from design to erection to maintenance. Crane quality throughout—in valves, fittings, pipe, accessories, and fabricated piping—makes dependable performance a foregone conclusion.

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SOURCE OF SUPPLY
RESPONSIBILITY
STANDARD OF QUALITY

Look at this steam header installation for example. Every piping item is from Crane. That means all the benefits of standardization . . . all the benefits of this 3-way advantage:

ONE SOURCE OF SUPPLY offering the world's most complete selection of steel, iron, brass and alloy piping materials for all power, process, and general service applications.

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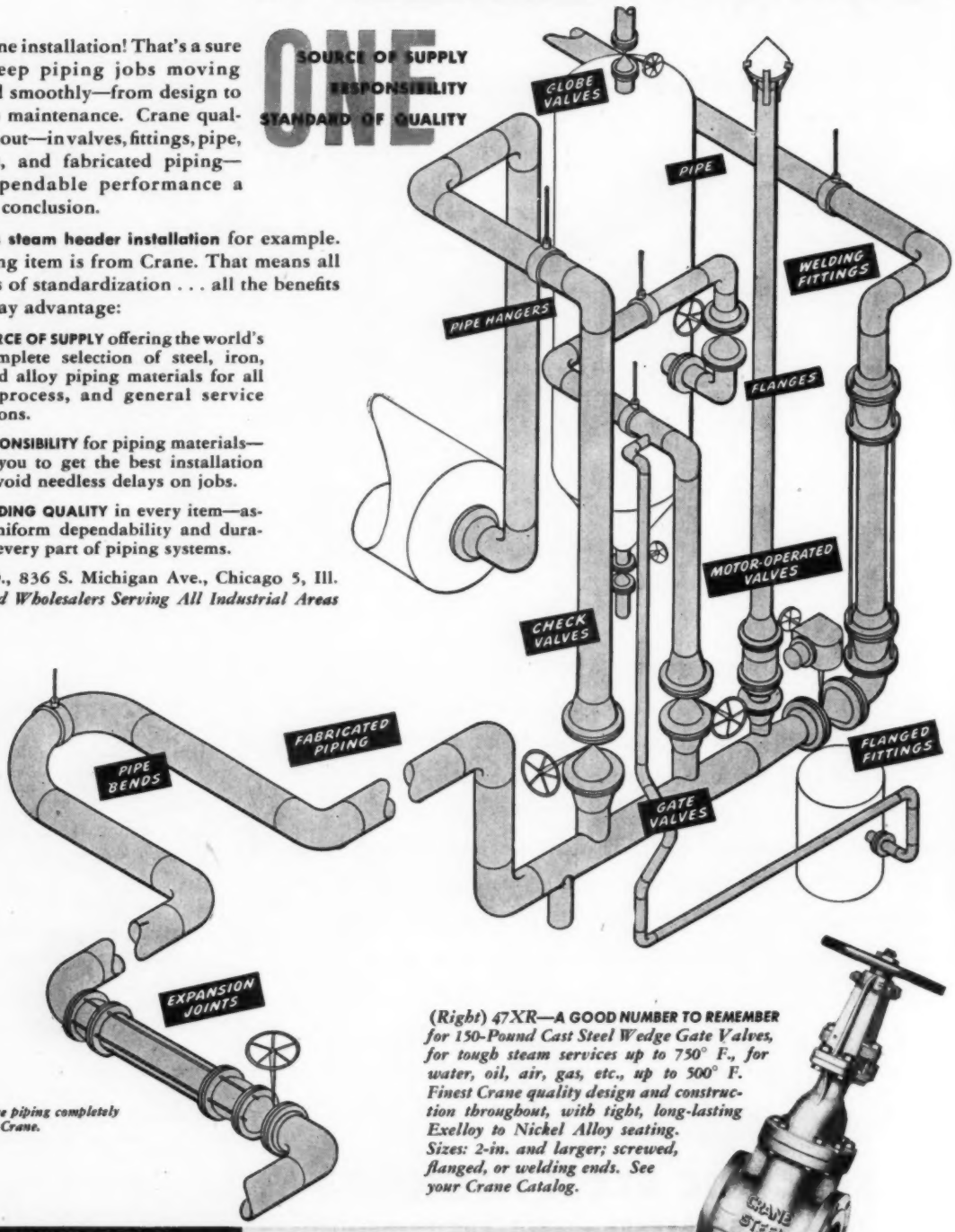

Steam service piping completely equipped by Crane.

(Right) 47XR—**A GOOD NUMBER TO REMEMBER** *for 150-Pound Cast Steel Wedge Gate Valves, for tough steam services up to 750° F., for water, oil, air, gas, etc., up to 500° F. Finest Crane quality design and construction throughout, with tight, long-lasting Exelloy to Nickel Alloy seating. Sizes: 2-in. and larger; screwed, flanged, or welding ends. See your Crane Catalog.*

EVERYTHING FROM . . .
VALVES • FITTINGS
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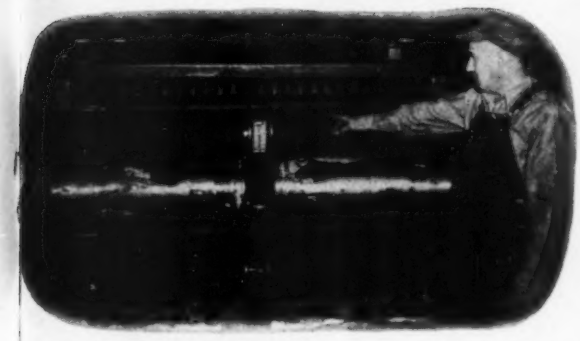
AND HEATING

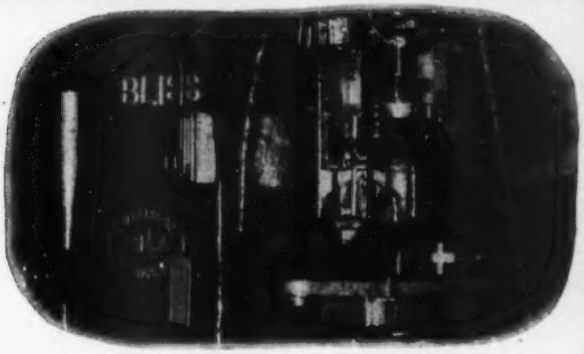
CRANE

FOR EVERY PIPING SYSTEM

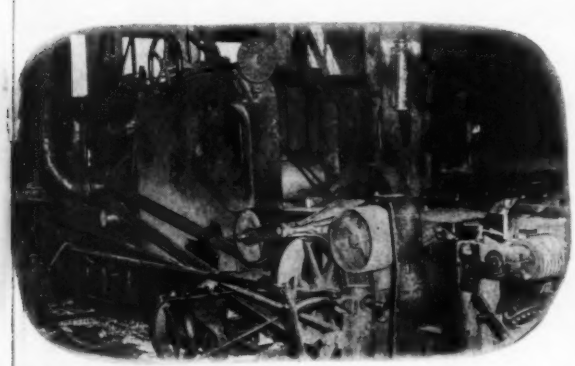
Stanodrip ...Stays on those hard-to-lubricate spots



Stops oil leakage. Cleanliness counted in a midwest woolen mill. Oil drip from carding machine bearings was staining finished wool products. Stanodrip lubricated these bearings without leaking. Oil consumption went down 50%.



Cuts oil consumption. Lubricant run-off from the bearings on stamping and drawing presses caused excessive oil consumption, made floors dangerously slippery, and made bearing lubrication uncertain. Stanodrip provided safe, positive lubrication for the bearings, lowered oil consumption 80%.



Prevents bearing wear. Six breakdowns due to burned-out bearings occurred on this fast-turning planer in the year before Stanodrip was installed. Stanodrip's adhesive and lubricating properties stopped the trouble. Bearings were thoroughly covered and lubricated despite the planer's high speeds. Oil consumption dropped 50%.

Resists run-off. Conventional oils ran off the slide bearings of this high-speed wood veneer slicer. To prevent bearing wear, and to thus avoid inaccurate work, three oilings were needed each eight-hour shift. When Stanodrip was given the job, it stayed on the slides, gave adequate protection. Oilings per shift were reduced to one.

You can count on Stanodrip to solve oil leakage, drippage, or throw-off problems in your plant. Because of its unusual stringiness and driplessness, this unique oil adheres to hard-to-lubricate surfaces. It protects these surfaces against wear by its excellent lubricating ability and high resistance to oxidation or gumming.

To help you gain the economical advantages of Stanodrip in your plant, a Standard Oil Lubrication Engineer is at your service anywhere in the Midwest. Write Standard Oil Co. (Ind.), 910 S. Michigan Ave., Chicago 80, Ill.

TANDARD OIL COMPANY (INDIANA) STANDARD

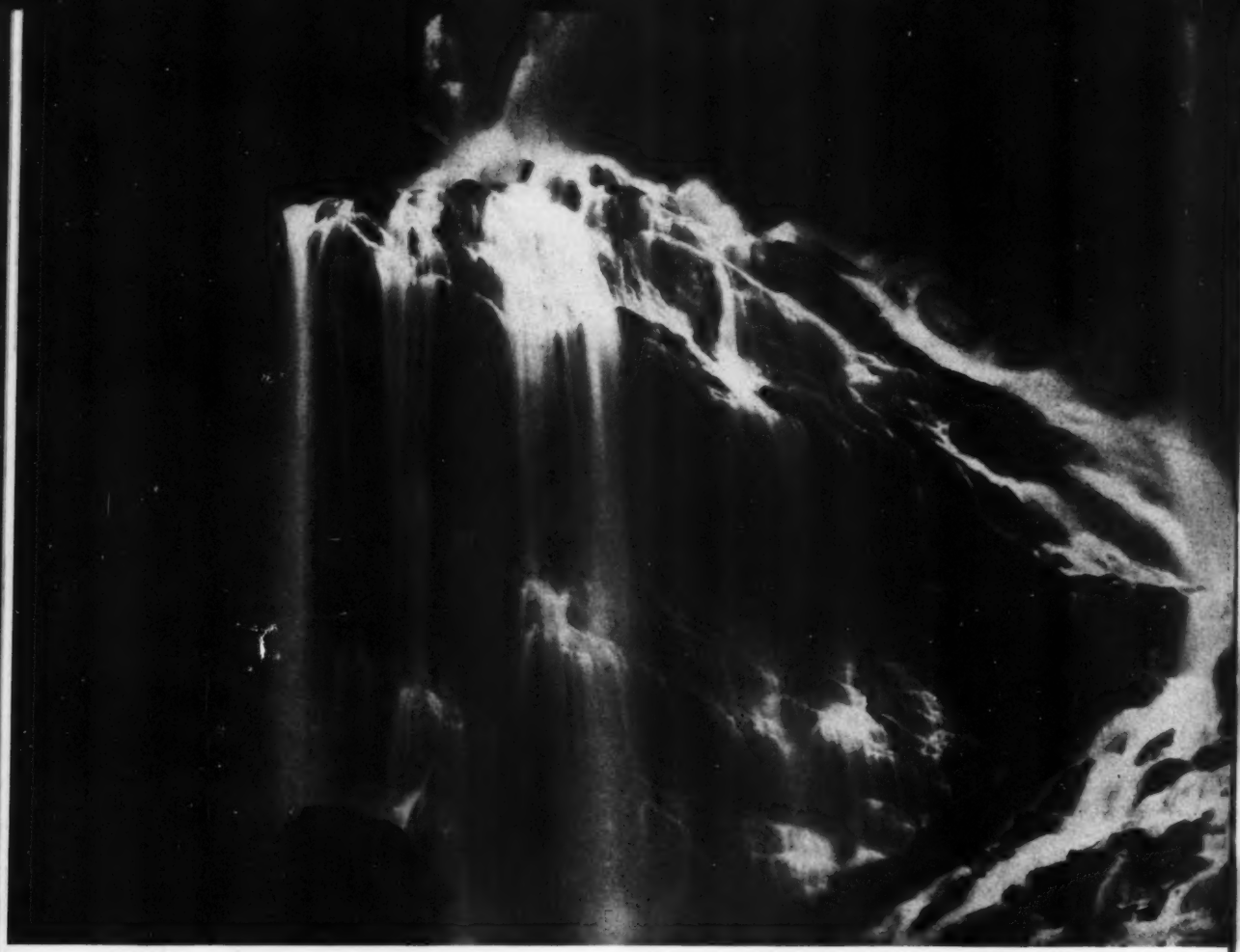
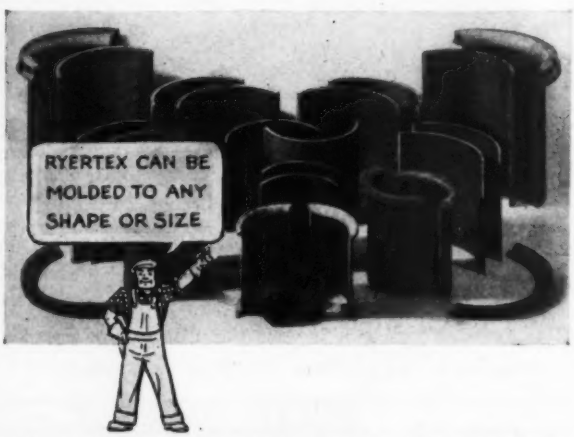


Photo of Nature's Low-Cost Lubricant

Best for Ryertex Bearings



• Ryertex applications include bearings for: Beaters, Washers, Grinders, Jordans, Refiners, Fourdriniers, Press Rolls, Calenders, etc., plus Ryertex Suction Box and Pipe Covers and Forming Boards.

Real bearing economy is yours with Ryertex. Because laminated-plastic Ryertex bearings operate at high efficiency with water lubrication only — slashing costs for lubricants and their application. In addition, by eliminating oil and grease that are a frequent source of specks in paper, Ryertex bearings reduce the chance of dirt spoilage — another economy.

It's only logical to use Ryertex at the wet end of paper machines where oil lubrication is difficult. And with Ryertex on press and calender bearings, water used as a coolant can easily serve as a lubricant as well.

Records of many mills prove that Ryertex bearings outlast bronze and babbitt 4 to 10 times. Installation is easy without radical changes in housings.

A Ryertex engineer will gladly make recommendations. Investigate the advantages of economical Ryertex Bearings for your equipment today. Descriptive bulletins on request.

Joseph T. Ryerson & Son, Inc. Ryertex Division: Chicago, New York, Los Angeles.

RYERSON - RYERTEX

THE PAPER INDUSTRY
and PAPER WORLD

JANUARY 1948

The Sampling and Analyzing of Sulphate Recovery Furnace Stack Gases

T. T. COLLINS, JR.
Thilmany Pulp & Paper Co.

A REVIEW OF THE LITERATURE

▶▶▶ IN CONSIDERING sulphate recovery furnace stack gases, the necessity of choosing methods of sampling and analysis which will give correct results must not be overlooked. However, in spite of the large number of stack gas measurements which have been made in many mills and the years of work on this problem by outsiders working in this field for the pulp mills, no generally accepted method of sampling has been adopted by the paper industry although many of the procedures agree on certain fundamentals.

The basis for some of the recovery furnace gas sampling methods was the work of Brady and Touzalin (*1*) on blast furnace gases. For determining the wet bulb temperature of gases they devised a psychrometer consisting of a tube fitted with a water cup and a wick attached to the bulb of a thermometer so that the gas blowing over the bulb would evaporate water from the wick and give the wet bulb reading on the thermometer. For determining the dust content of the gas they used the Brady filter consisting of a sampling tube and a Soxhlet extraction thimble on the end of the sampling tube inside a jacket to filter the dust out of the gas passing through it. The filter jacket was electrically heated so as to prevent condensation of moisture in the jacket as this would result in more rapid plugging of the filter. A condenser was connected behind the filter to reduce the gases to room temperature and the gas volume, pressure, and temperature were then measured with a wet gas meter. The gas was pulled through the sampling apparatus by a vacuum pump attached to the outlet connection of the gas meter. Brady and Touzalin formulated several rules for dust sampling which are still considered good procedures. They sampled the dust at the point of average gas velocity in the duct and pointed out the importance of sampling at the velocity of the gas at the sampling point. In order to determine the correct velocity for sampling, the point of average gas velocity in the duct was first located by a Pitot tube traverse and check tests were made during the run to see that the sampling velocity was correct.

Modifications of the method of Brady and Touzalin have been described by several investigators working on soda or sulphate recovery furnace fume. Spence (*2*) used alundum thimbles for gases above 450 Fahr. Horne (*3*) said that the sampling velocity for sulphate fume is unimportant as the particle size is so small that the particles act like gas molecules. He claimed that pointing the sampling tube downstream with respect to the stack gas flow did not affect the accuracy of the results. Venemark (*4*) suggested using as large a sampling tube as possible and found that for fine fume the results are, within certain limits, independent of the sampling conditions. Gas sucked at high speed through a sampling tube turned in the direction of flow of the gases gave a value 60 per cent of a measurement made with the correct procedure. Anderson (*5, 6*) discussed a similar method of dust sampling and gave data showing that the correct average velocity of gas in the sampling tube to use is about 95 per cent of the velocity of the gas in the duct at the sampling point. The importance of the sampling velocity in the case of large dust particles has also been discussed by Allner (*7*), Mackenzie (*8*), Fahrenbach (*9*), Zimmermann (*10*), Stern (*11*), Rosin and Rammler (*12*), Christensen (*13*), Hardie (*14*), Bubar (*15*), and Venemark (*4*).

The procedures and equipment for dry dust sampling are described and the necessary methods of calculations are clearly outlined in bulletins issued by Research Corporation (*16*) and Western Precipitation Corporation (*17, 18*) and these procedures are widely used in the paper industry. Venemark (*4*) has used a dust sampling outfit similar to that of Simon described by Lunge-Berl (*19*) and others (*20*). Western Precipitation Corporation also lists a laboratory size electrofilter or electrostatic precipitator which can be used for estimating the dust content of gases.

The so-called "wet method" of running the soda and sulphate recovery furnace stack loss tests has also been widely used, particularly where it is desired to determine the soluble constituents of the dust rather than the total dust loading and the gases are nearly saturated with water vapor at a moderate temperature. Western Precipitation Corporation's bulletin (*17*) gives an example of this method in which the gases are drawn from the stack through a tube packed with glass wool and a wet cotton plug. The condensate and soluble dust are trapped in a bottle and the gases are drawn through a condenser and a gas meter by a vacuum pump.

Gardner and Whitney (*21*), and Whitney and Vivian (*22*) recom-

mended exploration of the stack duct with the sampling tube similar to the method used in making Pitot tube velocity determinations. This exploration was for the purpose of eliminating any error resulting from nonuniformity of dust distribution in the gas stream and was carried out by a Pitot tube connected closely to the tip of the sampling tube. Using known relationships expressed graphically between the Pitot tube reading and the corresponding flowmeter differential on the sampling apparatus, it was possible to sample at the correct velocity at every change of station. The fumes from a soda recovery furnace were collected by bubbling the gas through a sampling train of three or four bottles partly filled with water in series. The bubbling devices used were closely woven cloth bags tied on the inlet tubes of the absorption bottles under the liquid. Tests showed that in these investigations all the sodium salts were absorbed in the first two washing bottles. Alundum thimbles and glass wool packed towers were found to be less desirable for use in this method than the cloth bags.

Another "wet method" of sampling is that used by The Babcock and Wilcox Company (*23*). The gas and fume sample are drawn from the stack at the correct velocity through a sampling tube and a condenser. The condensate is caught in a trap bottle and the gas is bubbled through a bottle containing distilled water (the "moistening bottle") and then through a Gooch crucible packed with wet cotton in another bottle called the "fume catcher bottle." The sulphur gases are absorbed in a bottle of sodium carbonate solution and the noncondensible gas is measured with a dry gas meter before passing through a vacuum pump.

A study of these previously used methods has convinced the author that some simplification of these procedures would be desirable. All have one fault in common and that is that gas velocity determinations must be made with a Pitot tube for each sampling run and an attempt made to calculate the correct sampling velocity from these results. Should a change occur in location of the sampling tube, dry and wet bulb temperatures of the gas, percentage composition of the gaseous components, and resistance to passage of gas in the sampling train during a run, then the sampling rate would probably be in error. In addition, when a gas nearly saturated at a high temperature is sampled, it is necessary to consider in the calculations the condensate which will result from the gas before it goes through the meter.

The dry dust sampling methods do not appear to offer any advantage over "wet methods" when the constituents in the gas to be measured are the soluble sodium salts. The dry methods require more complicated apparatus and have not been recommended for use on saturated gases in which condensation would be taking place as would be the case in the exit gas from a stack gas scrubbing operation. In addition, the sampling tubes used before the dust collecting thimbles must be rinsed out to remove the sodium salts adhering to the inside of the tube so it is equivalent to a wet method in this respect.

The disadvantage of the "wet method" used by Whitney and Vivian (*22*) and Gardner and Whitney (*21*) appears to be the use of several bubbling flasks and the resultant volume of solution for combination and analysis. Sampling of sulphate stack fume at a very high rate ordinarily requires more than two or three simple bubbling flasks to wash the salt cake out of the gas and the efficiency of such collectors would depend on the filtering ability of the closely woven cloth bags to some extent. In addition, a gas flow meter does not appear as desirable as a dry gas meter for this application. Venemark (*4*) has pointed out the difficulty of collecting samples by condensation of the gases alone.

Weighing of the dry dust sample caught by a thimble cannot be considered a correct analytical procedure when it is desired to determine the actual sodium content of the dust on which to base the calculation for fume content. In addition, the analytical procedures described in the method used by The Babcock and Wilcox Company (*23*) are somewhat lengthy and are no more accurate than simple, direct methods for determining sodium.

After consideration of the disadvantages of these various methods, the author has decided to consider the possibilities of using the so-called "balanced" sampling tube. Although the balanced sampling tube has been known for several years, it has not found wide acceptance for use in conjunction with dust sampling apparatus for sulphate recovery furnace stack gases. The reluctance on the part of engineers making stack gas analyses to use some modification of the balanced tube is difficult to understand because its use eliminates the necessity for gas velocity determinations and the resultant calculations for determining the correct gas sampling rate. In addition, changing conditions during a test run can be compensated for easily and instantly.

The balanced sampling tube and its theory were developed by Allner (*7*). He found that when the average velocity of the gas entering the sampling tube is the same as the velocity of the gas in the duct at the sampling point, the static pressure of the gas in the duct at the sampling point and the static pressure of the gas just inside the entrance to the sampling tube are equal. By connecting a manometer between the static connections for the points mentioned and drawing the gas through the sampling tube at a rate such that the manometer differential was zero, Allner showed that a simple and accurate method is possible for sampling gas at its velocity at the sampling point. One design of the "balanced" sampling tube was used in conjunction with a filtering thimble enclosed in a jacket.

The sampling apparatus of Brady and Touzalin has been modified to include a "balanced" sampling tube by chemists for the United States Steel Corporation (*24*). Other designs of sampling nozzles containing dust filters and utilizing the "balanced" tube method have been described by Zimmermann (*10*) and Hardie (*14*). The use of the "balanced" tube with other sampling arrangements has been discussed by Horne (*3*), Mackenzie (*8*), Rosin and Rammler (*12*), Christensen (*13*), Hardie (*14*), Anderson (*5*), Whitney and Vivian (*22*), the Western Precipitation Corporation (*17*), Buell Engineering Company (*29*), and Lapple (*30*). Several designs have been shown in the Power Test Codes of the ASME (*31*).

Christensen (*13*) has described the McMicheal automatic sampler. This combines the "balanced" tube and a controlling diaphragm in combination with the differential gauge so that any variation from zero differential results in an automatic speed adjustment of the suction fan on the sampling apparatus.

Whitney and Vivian (*22*) encountered difficulties in trying to use the "balanced" tube in sampling soda recovery furnace fume due to rapid plugging of the static holes. Anderson (*5*) has discussed some of the theoretical aspects of the "balanced" tube and disagrees with previous investigators that zero differential on the manometer indicates an average sampling rate equal to the gas velocity in the stack at the sampling point. This same argument for such an error in using the "balanced" tube is mentioned in the Western Precipitation Corporation's bulletin (*17*) and it is said that the average sampling velocity is approximately 83 per cent of stack velocity at the sampling point when the differential manometer reading is zero.

Anderson (5) explains that when the *average* gas velocity in the sampling tube is equal to the velocity of the gas in the flue at the sampling point, the velocity of the gas in the *center* of the tube must be higher, resulting in a lower sampling than 100 per cent. On the other hand, if the maximum velocity in the sampling tube equals the duct velocity, then the velocity of the gas at the walls of the sampling tube would be considerably less than the duct velocity and the sampling would be high. His experiments showed that an average gas sampling velocity of approximately 95 per cent of the gas velocity at the sampling point gives 100 per cent sampling. Presumably the static pressure difference on the manometer equals zero when the *center* tube velocity equals the duct velocity. Anderson also points out that for fumes and very light dusts the rate normality variations should have a lesser effect on the weight accuracy.

In a communication, Whitney (25) has stated that he assumed when using a "balanced" sampling tube that the velocity distribution of gas across the sampling tube entrance is constant and, since the static hole inside the tube is near the entrance to the tube, the normal velocity distribution has not occurred. Based on this assumption, he believes that the average velocity of the gas entering the tube and the velocity of the gas in the duct are equal when the balancing manometer reads zero.

Whitney also points out that Anderson has apparently assumed that at the static holes the normal velocity distribution exists such as would be expected when the gas is passed through a considerable length of straight pipe, and under such conditions and at Reynold's Numbers in excess of 100,000 the average velocity is about 83 per cent of the maximum (or axis) velocity.

Lapple (32) has stated that check measurements made with his sampling apparatus prove that the zero manometer differential indicates approximately 100 per cent of the gas velocity at the sampling point if the inside static holes are only a few pipe diameters from the mouth of the sampling tube.

In the method of sampling and analysis suggested by The Babcock and Wilcox Company (23) is suggested the absorption of gaseous sulphur compounds in a sodium carbonate solution contained in an absorption flask inserted between the fume catcher and the gas meter in the sampling apparatus. The total sulphur absorbed is then determined by oxidation of a sample of the sodium carbonate solution with bromine water and precipitation of the sulphate sulphur resulting with barium chloride. If it is necessary to determine the sulphite or the sulphide sulphur in the alkaline solution, they can be separately determined by any one of several procedures which are generally known.

Klason (26) analyzed the furnace gases by precipitating the hydrogen sulphide and methyl mercaptan in mercuric cyanide solution. The mercaptide was decomposed with hydrochloric acid and the liberated methyl mercaptan was absorbed in alcohol and titrated with iodine solution. Hägglund and Hedlund (27) modified Klason's method by precipitating the liberated mercaptan in another mercuric cyanide solution and weighing it.

Venemark (4) absorbed the hydrogen sulphide in mercury cyanide solution and then absorbed other sulphur gases and carbon dioxide in strong KOH solution.

Bergstroem and Trobeck (28) have separated the gaseous sulphur compounds in stack gases by absorption of the hydrogen sulphide in cadmium chloride solution, the mercaptan in mercuric cyanide solution, and the dimethyl sulphide in mercuric chloride solution.

The Babcock and Wilcox Company (23), Venemark (4), Whitney and Vivian (22), and Gardner and Whitney (21) have described the various analytical methods they used to determine composition of their fume samples.

Acknowledgement

The author wishes to express his appreciation to Anders Kjellgren for the translations of Swedish articles.

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How Silica Reduction in Boiler Feedwater Improved Paper Mill Power Plant Operation

D. G. COOPER[1]
and
JOHN B. DAVIS[2]

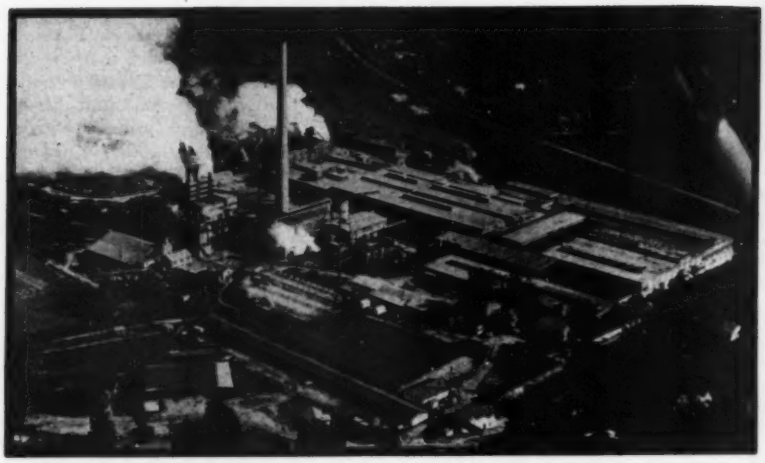


Fig. 1—Blanketing the village of Hodge (La.), paper and bag manufacturing operations of the Southern Advance Bag & Paper Company include a 300-ton pulp mill, a 350-ton paper mill, and a completely self-contained bag mill with a capacity of 20,000,000 bags a day

HOW SILICA REMOVAL from the boiler feedwater halved boiler outages and cut turbine downtime and maintenance costs to a minimum for the Southern Advance Bag & Paper Company is an interesting case history in effective water conditioning.

One of the leading manufacturers of paper bags in the South, Southern Advance at Hodge, Louisiana, has a daily steam production average of 9,350,000 pounds from nine boilers serving five turbines generating 12,000 kw. and auxiliaries including turbines operating paper machines.

Silica reduction has achieved impressive results in these power plant operations, and the previous record presents a striking contrast with current operations. In 33 months of operation, for example, there were 57 boiler shutdowns totaling 834 boiler hours of unscheduled outages. Prior to silica reduction, it was necessary to open turbines for sand blasting every four months, a loss of 18 to 20 turbine hours a year. At the same time, power production dropped off as much as 50 per cent during the last two or three weeks of the customary four months run.

An analysis of raw water samples taken over a period of thirteen years (Table 1) showed an average silica content of 43.6 ppm, ranging from a low of 30 ppm to a high of 57 ppm.

With the introduction of an Allis-Chalmers product known as SILIMITE, a silica reduction of 94 per cent has been achieved. With the softener operating at 100 per cent of capacity, records of treated water now show a low silica content of 0.8 ppm and a high (at a time of extreme softener overloading) of 8.0 ppm, with an average of 2.7 ppm (Table 2).

The contrast in feedwater quality, particularly as to silica content, is strikingly seen in typical analyses of "before" and "after" periods (Table 3).

Comparison of the samples analyzed before and after external silica reduction was started (Table 4) indicates that in the latter case blowdown requirements are virtually half those of the former. But the silica content of the boiler water is still less than half of what it was before the external silica reduction was inaugurated.

Water for boiler feed purposes is obtained from two company wells and delivered to a concrete reservoir, from which it is pumped through the oil and air coolers before being treated in the 24,000 gph hot process softener and filtered through three 10-ft. diameter Anthrafilt filters. The filtered water is transferred to the "surge tank," where it is mixed with the mill condensate coming from the surface condensers, paper machines and the first effect of several evaporators. This mixture is pumped to the

Fig. 3—Main boiler room of Southern Advance Pulp & Paper Company

(1) Chief Engineer, Southern Advance Bag & Paper Co., and (2) Sales Engineer, Water Conditioning Dept., Allis-Chalmers Mfg. Co.

TABLE 1—Raw Water Analysis
Average of Thirteen Samples
April 1944-March 1947

	PPM
Total Hardness ($CaCO_3$)	28.3
Total Alkalinity "M" ($CaCO_3$)	86.4
Sodium Alkalinity	58.1
Calcium (Ca)	7.4
Magnesium (Mg)	2.0
Sodium (Na)	43.5
Silica (SiO_2)	43.6
Bicarbonate (HCO_3)	104.8
Sulphate (SO_4)	16
Chloride (Cl)	10.8
Nitrate (NO_3)	1.5
*p*H	7.3

feedwater heaters, from which it flows to the boiler feed pumps.

The reaction chamber of the softener is 12 feet in diameter by 30 feet high on the straight side and is equipped with a vent condenser, raw water spray nozzle, vacuum breaker and loop seal.

In order to secure more effective results, the softener is operated at 220 Fahr. and a portion of the sludge is recirculated at the rate of approximately 5 per cent of the quantity of raw water to be treated. The sludge recirculating pump receives its suction from the bottom of the sludge cone and discharges into the top of the reaction chamber. The available raw water (see Table 1) requires no soda ash for softening, and the lime requirement is supplied by SILIMITE. Accurate proportioning of this chemical is accomplished by an electromagnetic proportioner mounted on top of the chemical mixing tank. Electrical impulses received from a contact head attached to the raw water meter actuate the proportioner in direct proportion to the water flowing to the softener. With each meter contact the proportioner lowers a swing takeoff pipe into the chemical solution tank a definite unvarying distance, thus permitting a precise dosage of SILIMITE to flow into the pump suction tank, from which it is delivered to the top of the softener.

Chemical Requirements and Control

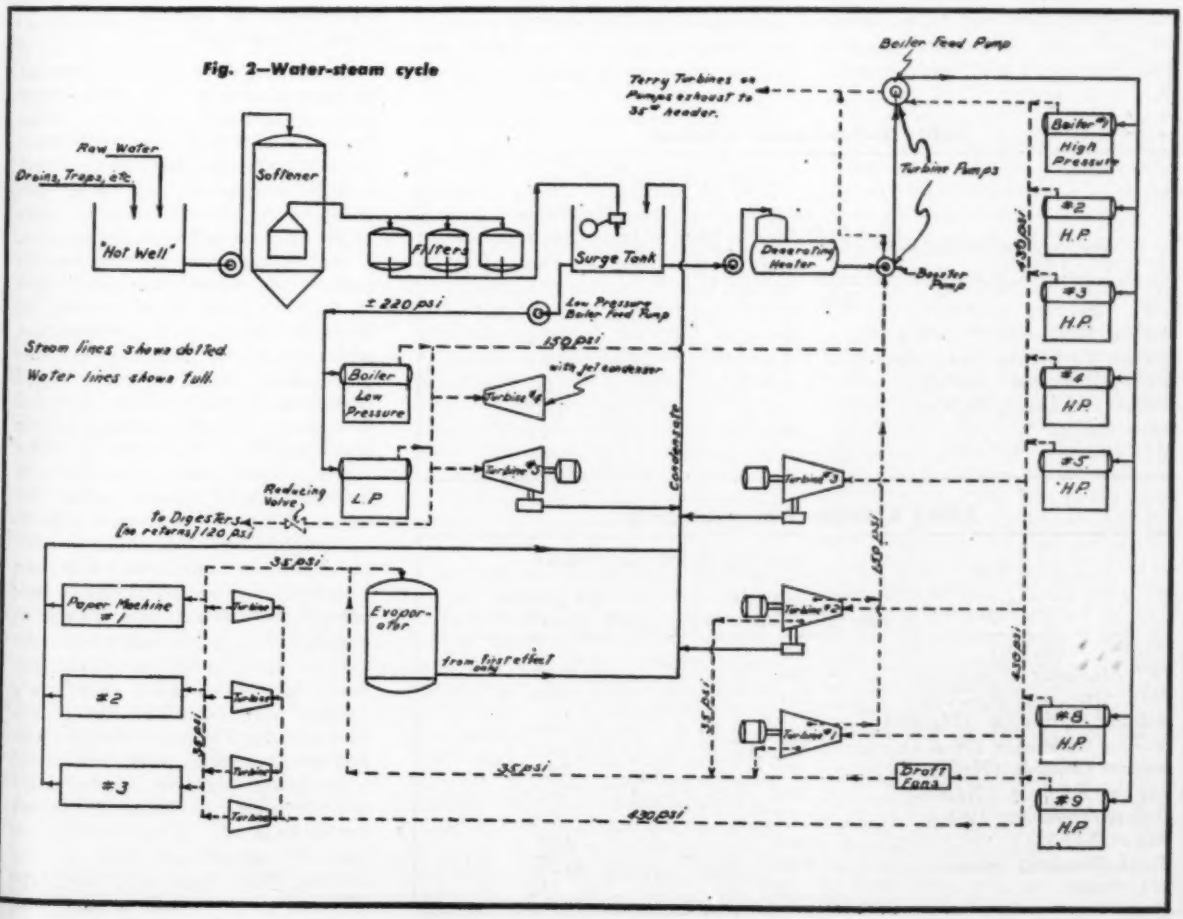
The SILIMITE requirement approximates 100 ppm. Sludge cone blowdown is regulated so as to carry an optimum concentration of sludge, which is checked at one hour intervals. The filters are normally backwashed each twelve hours with treated water taken from the outlet of the reaction tank, the backwash effluent being returned to the top of the softener.

Softener operation is controlled by tests for hardness, phenophtahalein and methyl orange alkalinities and soluble silica, which are run every four hours. The chemical charge is adjusted so as to maintain a 2 P-M

TABLE 2—Treated Water Analysis
Average of Fourteen Samples
August 1944-February 1947

	PPM
Hardness ($CaCO_3$)	9.9
"P" Alkalinity ($CaCO_3$)	51.7
"M" Alkalinity ($CaCO_3$)	65.1
Sodium Hydroxide (NaOH)	31.8
Sodium Carbonate (Na_2CO_3)	16.6
Sodium Chloride (NaCl)	13.6
Sodium Sulphate (Na_2SO_4)	2.9
Silica (SiO_2)	2.7
*p*H value	10.2

Fig. 2—Water-steam cycle



reading in the softener effluent of 45-55 ppm. The raw water is tested for hardness, alkalinity and silica every 24 hours.

Boiler feed make-up requirements normally approximate 50 per cent. To compensate for the residual hardness in the boiler feed and to provide for satisfactory conditioning of boiler sludge, a polyphosphate and an organic dispersive are used as supplementary treating chemicals. These are slug-fed through the boiler feed line at four hour intervals.

Boiler water samples are tested each eight hours for alkalinities, chlorides, silica and excess phosphate. Control limits call for maintaining a phosphate residual of 40-50 ppm in all boilers. The blowdown, which approximates 4 per cent, is regulated so as to carry 170-180 ppm of chlorides as sodium chloride in the boilers at the main power plant and the bark burners, whereas this limit is set at 100-120 ppm in the recovery units.

In contrast with the costly record of boiler and turbine maintenance befort adopting SILIMITE, today the Southern Advance power plant is operating virtually without unscheduled maintenance. No tube failures have been reported since silica reduction measures have been taken (compared with the replacement of 133 tubes and welding of 29 in 33 months previous) and the boilers have operated at maximum ratings and efficiency for a minimum of twelve months between scheduled cleaning.

Instead of valuable turbine downtime lost, added to expensive sand blasting, assembly time and the cost of purchased power, turbines are now operating at least twelve months between scheduled inspections, and no sand blasting or cleaning is required.

Silica reduction has provided a steam of excellent quality, and at the same time efficiency of this power plant is maintained at the rated capacity.

Fig. 4—Main turbine room at Southern Advance contains five steam turbine generating units

TABLE 3—Feedwater Analysis

	Average (parts per million)	
	9 Samples May 1941-March 1943	16 Samples August 1944-Feb. 1947
Hardness ($CaCO_3$)	20.4	16.1
"P" Alkalinity ($CaCO_3$)	0	17.1
"M" Alkalinity ($CaCO_3$)	45.5	34.6
Sodium Hydroxide (NaOH)	0	5.1
Sodium Carbonate (Na_2CO_3)	0	15.6
Sodium Chloride (NaCl)	7.3	6.5
Sodium Sulphate (Na_2SO_4)	13.2	12.7
Silica (SiO_2)	26.5	4.4
*p*H Value	6.8	9.0

TABLE 4—Boiler Water Analysis

	Average (parts per million)	
	53 Samples May 1941-June 1943	23 Samples April 1944-Feb. 1947
Hardness ($CaCO_3$)	0	0
"P" Alkalinity ($CaCO_3$)	268	502
"M" Alkalinity ($CaCO_3$)	314	588
Sodium Hydroxide (NaOH)	178	326
Sodium Carbonate (Na_2CO_3)	70	143
Sodium Chloride (NaCl)	91	149
Sodium Sulphate (Na_2SO_4)	180	342
Sodium Phosphate (PO_4)	23.7	39.5
Silica (SiO_2)	254	112
Total Dissolved Solids	796.7	1111.5
*p*H Value	10.9	11.5

Description of Power Plant Equipment

There are three boiler rooms at Southern Advance. The main power plant is equipped with five boilers consisting of four Walsh and Widener combustion engineering units and one B & W boiler. All five are of sectional header, straight sloping tube, single cross-drum design. Boilers 1, 2, 3, and 4 are provided with waterwalls of an unusual design developed by D. G. Cooper, chief engineer at Southern Advance, in collaboration with the Henry Vogt Boiler Company. Boilers 1, 2, 3, and 4 are of riveted-drum construction, equipped with Foster Wheeler economizers and steam purifiers. The drum in boiler No. 5 is welded and is provided with baffles in lieu of a steam purification device. This unit contains a B & W economizer and superheater. The blowdown is continuous with the blowdown line coming from the bottom of the rear sectional header.

Boilers Nos. 1, 2, and 3 are individually rated at 22,500 pounds per hour while No. 4 and 5 each have a designed capacity of 30,000 pounds per hour. At a normal rating of about 200 per cent, steam production in the main power plant is approximately 271,000 pounds per hour. The boilers are gas-fired and operated at 430 psi, with 100 degrees super heat.

Two Elliott deaerating tray type

(Turn to page 1453)

Extraction Treatments in Bleaching Aspen Neutral Sulphite Semichemical Pulp*

S. A. TRIVEDI, Collaborator
R. M. KINGSBURY, Chemist
and
F. A. SIMMONDS, Chemist

Forest Products Laboratory,† Forest Service
U. S. Department of Agriculture

Abstract: In considering possibilities for improving the yield and quality of fully bleached semichemical pulp from hardwoods, attention was directed at the Forest Products Laboratory toward the extraction stage of the multistage chlorine bleaching process. An aspen neutral sulphite semichemical pulp of about 77 per cent yield and 12 per cent lignin content was chlorinated in quantity with 12 per cent chlorine, and portions of the chlorinated pulp were subject to various extractions, each of which was followed with sufficient hypochlorite to give a brightness of 82 ± 1. The material was evaluated after each stage of treatment.

The loss of cellulosic material in the chlorination stage, which, under practicable conditions, is unavoidable, was greater than the combined loss of this component in the extraction and hypochlorite stages. Of the various extractants studied, which included monomethanolamine, sulphurous acid, and lime, the results obtained with sodium sulphite indicated that it has practical possibilities. Its use, in comparison with caustic soda, was favorable to yield, folding strength, and rate of hydration of the bleached pulp. Caustic soda was somewhat superior to sodium sulphite with respect to action in shives.

▶▶▶ IN ORDER TO REALIZE the potentially high strength of hardwood neutral sulphite semichemical pulp it is necessary to remove most of the relatively large amount of lignin present in this type of pulp by the selective chlorination bleaching process. A high portion of chlorine in the elemental form is essential for the maximum increase in strength upon bleaching.

The ideal result in the bleaching of these high-yield semichemical pulps by the chlorine process would be the removal of only the lignin and other colored substances (assuming the lignin to be colored in its natural state). It has been shown by Ritter and Kurth (*18*) and by Thomas (*21*) that this ideal result can be essentially accomplished by the use of nonaqueous media in chlorination and extraction treatments and a limited amount of water at low temperature when washing out the reaction products. Conditions of that sort, however, are not economically feasible at the present time. Consequently, the immediate commercial production of fully bleached semichemical pulps would, of necessity, involve chlorination in the presence of water at a low density and extraction with low-cost alkalies likewise in water solution.

According to Norman (*15*), chlorination of wood in aqueous media releases hemicelluloses, a considerable portion of which, identified as polyuronide hemicelluloses, is soluble in water and the remainder soluble in a mild alkali such as sodium sulphite. The latter fraction is soluble, however, in sodium sulphite solution only after chlorination. Norman believes the preceding observations to be evidence of a lignin-hemicellulose linkage. Thomas (*22*) has shown that cellulosic material that has been isolated with the use of nonaqueous media in the chlorination and extraction treatments, contains a fraction soluble in water at 20 deg. C. It is thus evident that even if the use of nonaqueous media were commercially feasible, a certain amount of cellulosic material would be lost in converting the pulp into paper.

In view of the evidence of a lignin-hemicellulose linkage and the fact that a neutral sulphite semichemical pulp from aspen, for example, in yield of about 75 per cent, will contain approximately 40 per cent of the lignin and 60 per cent of the hemicelluloses originally present in the wood, the loss of carbohydrate material is apparently unavoidable when chlorinating these pulps under practicable conditions. Presumably, the amount of carbohydrate material lost will be proportional to the amount of lignin removed.

Although loss of carbohydrate material is to be expected in a conventional alkaline-extraction treatment, it was thought desirable, in the study at the Forest Products Laboratory herein reported, to obtain information on the comparative loss of hemicelluloses and the lignin removal under various extraction conditions followed by treatment with hypochlorite to an approximately constant brightness. Time available for the work permitted only one degree of chlorination to be studied. The scope of this study comprised the chlorination of a quantity of aspen neutral sulphite semichemical pulp with 12 per cent chlorine, extraction of portions of the chlorinated pulp under various conditions, treatment of the extracted samples in a single stage with hypochlorite to effect a brightness of 82 ± 1, and evaluation of the pulp at the various stages of treatment. Information was thus obtained upon the effect of the extraction treatments and the relative loss of cellulosic material in the three stages of treatment.

EXPERIMENTAL PART

Description of the Unbleached Pulp

The aspen neutral sulphite semichemical pulp was prepared under conditions generally used at the Forest Products Laboratory for this process.

Digestion procedure.—Digestion of the chips comprised (1) steaming them for 2 hours in the digester, (2) impregnation at 120 deg. C. for 1 hour with a cooking liquor composed of 70.5 grams per liter of sodium sulphite and 27.6 grams per liter of sodium bicarbonate, (3) blowing back the liquor not taken up by the chips during the impregnation, and (4) cooking the impregnated chips for 1 hour at 170 deg. C. During the digestion, 11.8 per cent of the sodium sulphite and 8.6 per cent of the so-

(*) This article is based upon work done by S. A. Trivedi as the thesis requirement for the degree of Master of Science at the University of Wisconsin, September, 1946, when Mr. Trivedi held a Watumull Foundation fellowship.

(†) Maintained at Madison, Wisconsin, in co-operation with the University of Wisconsin.

TABLE 1—Effect of chlorination, various extraction treatments, and oxidation with sodium hypochlorite on the composition, yield, brightness, and strength of an aspen neutral sulphite semichemical pulp

Treatment	Bleach		Bleaching conditions							Yield		Chemical characteristics of pulp before and after treatment[1]								Physical characteristics of pulp before and after treatment[2]								
	No.	Stage	Agent		Density	Temperature	Time	pH		Based on unbleached pulp	Based on wood	Lignin	Alpha cellulose[3]	Alpha cellulose[4]	Beta cellulose[4]	Gamma cellulose[4]	Ether soluble	Ash	Permanganate number	Freeness Schopper-Riegler	Bursting strength	Tearing strength	Tensile strength		Number of double folds	Stretch	Density	Brightness
			Name	Amount				Initial	Final																			
				Percent[5]	Percent	° C.	Hr.:Min.			Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent										
None					Unbleached pulp						76.6	11.6	62.4	63.7	11.8	6.7	0.67	1.36	88.8	710	0.57	0.95	4,040	20.3	87	2.7	0.60	
Chlorination	1/4 to 1/2	1	Chlorine	12.0	10.0	25	1:30	7.3	1.5	48.4	67.7	5.6	69.3	70.6	11.1	7.2	.64	.89	13.7	680	.70	1.10	5,280	24.0	184	4.0	.66	
Extraction	1	2	Water		10.0	70	1:00	5.5		67.3	67.0	4.8	74.7				.58	1.0	13.4	625	.79	1.05	5,680	26.1	420	3.8	.66	
Oxidation	1	3	Sodium hypochlorite	7.25	10.0	38	3:20			62.0	63.6		77.2							575	1.02	.99	8,680	32.2	575	5.0	.82	62.7
Extraction	2	2	Monoethanolamine[9]	1.00	10.0	70	1:00			66.3	66.1	1.3	73.0					.7	6.6									
Extraction	2	2	Monoethanolamine[10]	1.00	10.0	70	1:00			62.5	63.5	1.5							6.6	650	.77	1.11	5,850	26.1	220	4.7	.68	
Oxidation	2	3	Sodium hypochlorite	4.75	10.0	38	6:00			60.6	61.7		77.2							610	.96	1.08	8,040	31.0	238	5.3	.79	63.4
Extraction	3	2	Sodium sulfite	1.35	10.0	90	1:00			65.3	65.3	2.0	76.2	76.5	18.5	.8	.27	.9	6.3	590	.94	1.3	7,070	33.8	506	4.9	.65	
Oxidation	3	3	Sodium hypochlorite	3.85	10.0	38	5:20			61.8	62.7		77.4	76.3	16.8	3.6				660	1.16	1.05	9,680	37.7	794	5.8	.78	62.3
Extraction	4	2	Sodium sulfite	1.35	10.0	90	1:00			64.9	65.0	1.9	78.7					.7	6.0	600	.83	1.26	6,550		195	5.3	.67	
Oxidation	4	3	Sodium hypochlorite	3.80	10.0	38	4:15			61.9	62.7		77.2							680	.95	1.06	7,580	28.6	377	5.25	.81	62.6
Extraction	5	2	Sodium sulfite	1.35	10.0	60	1:00	7.0	6.6	64.6	65.0	2.0	76.4					.7	7.3	620	.92	1.29	6,630	33.7	336	5.7	.64	
Oxidation	5	3	Sodium hypochlorite	3.40	10.0	38	4:15			61.0	62.0		78.2							645	1.06	1.07	7,860	30.2	493	5.7	.79	62.6
Extraction	6	2	Sodium sulfite	1.35	10.0	70	1:00	7.1	6.9	64.0	64.4	2.1	76.5	76.8	19.8	.8		.7	7.4	605	.82	1.09	6,560	29.2	296	5.4	.69	
Oxidation	6	3	Sodium hypochlorite	3.10	10.0	38	5:15			60.6	61.7		77.9	77.5	19.0	2.3		.6		595	1.05	1.04	8,230	31.2	315	5.5	.80	62.5
Extraction	7	2	Sodium sulfite	2.25	10.0	60	1:00	7.3	6.2	63.7	64.2	1.5	77.2	77.0	16.5	3.7		1.0	5.8	570	.86	1.07	7,040	31.9	585	4.5	.66	
Oxidation	7	3	Sodium hypochlorite	2.50	10.0	39	4:30			61.6	62.7		78.3	79.0	16.4	3.7		.7		595	1.03	1.13	8,570	33.2	581	6.1	.78	62.0
Extraction	8	2	Sodium sulfite	1.35	10.0	60	1:00	7.2	7.0	64.7	65.0	1.8	76.0					.8	7.2	580	.92	1.07	7,160	30.3	470	5.7	.72	
			[9] Monoethanolamine	.50																								
Oxidation	8	3	Sodium hypochlorite	3.39	10.0	39	4:50			60.9	61.9		78.3							585	1.07	1.09	8,280	31.9	505	6.0	.79	62.5
Extraction	9	2	Sulfur dioxide	1.8	10.0	60	1:00	3.4	2.8	67.5	67.0	4.4	73.6						11.4	645	.81	1.09	5,660	26.1	346	4.8	.66	
Oxidation	9	3	Sodium hypochlorite	7.0	10.0	39	3:45			59.9	61.2		77.0					.5		595	1.11	.97	7,150	30.0	710	3.8	.73	61.9
Extraction	10	2	Sodium hydroxide	.9	10.0	85	1:00	9.3	9.0	63.4	64.0	2.1	78.1	77.3	15.9	4.6		.7	7.1	560	.97	1.20	6,380	31.0	624	6.4	.63	
Oxidation	10	3	Sodium hypochlorite	3.3	10.0	39	4:00			60.0	61.3							.6		595	1.03	1.01	8,480	32.5	642	6.1	.80	61.3
Extraction	11	2	Sodium hydroxide	1.8	10.0	85	1:00	11.3	10.7	64.1	64.7	1.4	78.4	78.2	17.5	2.3		.9	4.9	590	.90	1.10	7,240	31.6	470	4.8	.67	
Oxidation	11	3	Sodium hypochlorite	2.85	10.0	38	6:00			59.9	61.3		80.5	79.5	16.3	3.3		.8		567	1.05	1.08	8,540	32.7	396	5.6	.79	61.5
Extraction	12	2	Sodium hydroxide	.9	10.0	40	1:00	9.0	8.7	63.2	63.8	2.0	77.0					.9	7.0	577	.87	1.18	6,480	28.6	450	5.2	.69	
Oxidation	12	3	Sodium hypochlorite	3.3	10.0	39	4:50			60.1	61.3		77.6					.7		584	1.05	1.05	8,360	33.8	554		.80	62.3
Extraction	13	2	Sodium hydroxide	.9	10.0	90	1:00	8.8	8.3	63.4	64.0	2.0	76.9						6.9	570	.86	1.07	6,740	29.8	411	5.2	.69	
Oxidation	13	3	Sodium hypochlorite	3.3	10.0	39	4:45			60.6	61.7		78.1					.5		480		1.12	1.04	9,050	37.0	475	6.1	.81	62.7
Extraction	14	2	Sodium hydroxide	.9	10.0	60	1:00	8.7	8.0	63.2	63.8	2.0	75.6					1.0	7.2	555	.98	1.10	6,620	29.2	385	5.3	.69	
Oxidation	14	3	Sodium hypochlorite	3.25	10.0	39	4:15			59.2	61.6		78.1					.6		535	1.08	1.01	8,660	33.0	449	6.1	.79	62.5
Extraction	15	2	Sodium hydroxide	.9	10.0	70	1:00	8.5	8.0	62.2	63.1	2.0	76.3					.9	6.9	625	.82	1.09	6,100	27.7	294	5.2	.67	
Oxidation	15	3	Sodium hypochlorite	3.10	10.0	39	5:10			60.6	61.5		74.7	78.4	19.8	1.0		.6		540	1.11	1.07	8,500	33.0	415	5.9	.77	62.1
Extraction	16	2	Sodium hydroxide	3.5	6.0	85	1:00	11.5	11.0	61.2	62.2	1.2	76.4	77.0	16.5	4.0	.2	.9	4.1	630	.83	1.32	6,090	27.0	323	5.6	.68	
Oxidation	16	3	Sodium hypochlorite	1.65	10.0	39	5:50			76.0	59.8		78.9	77.5	21.5	2.0				550	1.0	1.11	7,960	32.2	504	6.5	.78	62.0
Extraction	17	2	Sodium hydroxide	3.5	12.0	85	1:00	11.5		60.3	61.6		78.1															
Oxidation	17	3	Sodium hypochlorite	1.2	10.0	38				79.6	60.8		78.7							630	.93	1.04	7,160	28.6	299	4.8	.76	61.6
Extraction	18	2	Sodium hydroxide	3.5	12.0	85	1:00	11.5		78.8	60.5		80.2															
Oxidation	18	3	Sodium hypochlorite	1.2	10.0	38				77.6	59.5		78.3	78.4	17.0	4.75				620	.99	.99	7,040	29.9	379	5.9	.71	62.0
Extraction	19	2	Calcium hydroxide	3.5	10.0	60	1:00	11.5	11.2	65.1	65.2	2.6	78.4					1.7	6.5	735	.58	1.15	3,640	19.8	96	4.0	.56	
Oxidation	19	3	Sodium hypochlorite	2.25	10.0	38	1:30			60.9	62.0									610	.82	1.26	6,440	27.6	369	5.2	.72	78.6
Extraction	20	2	Calcium hydroxide	3.5	10.0	60	1:00	11.5	11.2	65.1	65.2	2.6	78.4					1.7	6.5	735	.58	1.15	3,640	19.8	96	4.0	.56	
Oxidation	20	3	Sodium hypochlorite	3.00	10.0	38														580	1.02	1.02	7,500	30.0	458	5.8	.78	62.0

1 Percentage values are based on the pulp analyzed. The unbleached pulp contained 82.1 per cent cellulose (by holocellulose method) and 16.9 per cent pentosans. The chlorinated pulp contained 89.3 per cent cellulose (by holocellulose method), 17.8 per cent pentosans and 0.97 per cent chlorine.

2 Strength values are for unbeaten pulps. Test sheets were conditioned at 50 per cent relative humidity and 75 deg. Fahr., before testing. Ream size was 25 x 40—500.

3 The reaction mixtures during the oxidations were maintained alkaline to phenolphthalein.

4 Determined gravimetrically. The analyses were made on total cellulose isolated by the holocellulose method in the case of unbleached pulp and chlorinated pulp. In all other cases the caustic solution was applied directly to the pulp and the fibrous residue analyzed and corrected for lignin. The alpha-cellulose content of the chlorinated pulp when determined by the direct method was 71.5.

5 Determined volumetrically on the cellulose (isolated by the holocellulose method) of the unbleached and chlorinated pulps but directly on the other pulps.

6 Based on unbleached pulp. In stage 3, the percentage values refer to available chlorine as sodium hypochlorite.

7 Enough pulp was chlorinated to provide material for all extraction and oxidation treatments.

8 Corrected for chlorine content.

9 An alcoholic solution of monoethanolamine. The extracted pulp was washed with 95 per cent alcohol only.

10 A portion of the washed pulp from the preceding extraction was washed three times with water at 0 deg. C.

dium bicarbonate, based upon the weight of dry wood, were consumed.

Fiberization of the cooked chips.—The cooked chips were fiberized by one pass through a double-disk attrition mill. Consistence during milling was about 11 per cent. The plate clearance was adjusted to obtain a pulp having a freeness of about 500 cc. Canadian Standard, as it came from the mill. This pulp was screened on 8-cut plates and then thickened on a wet machine. To prevent molding in storage, a solution of phenyl mercuric acetate was applied to the wet web at the squeeze rolls of the wet machine at a rate of about 3 grams of dry solids per ton of pulp.

Yield of unbleached pulp.—The lignin content of the pulp after the wet machine operation was 11.6 per cent. On the basis of a lignin content-pulp yield relationship previously established at the Forest Products Laboratory, the yield of bleached pulp was estimated to be about 76.6 per cent.

Multistage Bleaching Process

Chlorination stage.—Six batches of pulp, the total equivalent of which was about 50 pounds upon a moisture-free basis, were chlorinated with 12 per cent chlorine, based upon the weight of pulp at 2 per cent consistence and 24 deg. C. ± 1 deg. in a glass-lined tank fitted with an agitator. The chlorine gas entered the pulp suspension at a rate varying from 0.041 to 0.049 pound per minute through a porous diffusion tube at the bottom of the tank. This arrangement assured complete absorption of the gas by the pulp suspension. Addition of the chlorine gas was completed in approximately 24 minutes.

Immediately after the exhaustion of chlorine, the pulp was washed thoroughly and dewatered to 20 per cent density in a manner that prevented loss of fines in either operation. After determination of yields, the six batches of chlorinated pulp were combined and the chemical composition and strength of the mixed material determined.

During the chlorination of two of the batches, the change in *p*H was measured with a glass electrode *p*H meter.

Extraction stage.—The extractions were made in duplicate with attractants and under conditions shown in Table 1.

In each case, a definite weight of the moist chlorinated pulp was heated to the required temperature. The extractant in solution in sufficient water to dilute the pulp to the required consistence was heated to the same temperature and was then mixed thoroughly with the pulp by hand. After an extraction period of 1 hour, the pulp was thoroughly washed without loss of fines with softened water at a temperature not higher than that used in the particular extraction. Yields were determined after the washed pulp was dewatered to about 20 per cent density, broken up, and thoroughly mixed.

One exception to the above washing procedure was after the extraction with alcoholic monomethanolamine solution. The extracted pulp was washed with alcohol, and the alcohol was then removed by three washes with ice water prior to bleaching. Chemical composition of the extracted pulp was determined before and after removing the alcohol, but the physical tests were made after removing the alcohol.

Hypochlorite stage.—All extracted pulps were treated in duplicate with sodium hypochlorite in the amount required to attain a brightness of 82 ± 1 to permit (1) a comparison of each extraction treatment as a part of a complete bleaching process and (2) to serve as one of the methods for evaluating the effects of the extraction treatments. A commercial sodium hypochlorite solution containing about 50 grams per liter of available chlorine and 8.1 grams of free alkali as sodium hydroxide per liter was used at a consistence of 10 per cent and a temperature of 38 deg. C. ± 1 deg. The reaction was allowed to proceed to exhaustion of the chlorine, until which point the mixture was maintained alkaline to phenolphthalein by addition of sodium hydroxide as required. Yield and brightness determinations were made on the bleached pulp after thorough washing without loss of fines.

Evaluation of the Effects of the Various Treatments

Tests used in evaluating the effects of the various treatments were in accordance with TAPPI Standards except as hereafter described.

In the volumetric determinations of alpha-, beta-, and gamma-celluloses, the results are ordinarily expressed as percentages of the cellulose content of the sample. In the present instance, these values were also recalculated to the basis of the whole sample analyzed. All of these samples contained mineral matter and some contained lignin. Values for the cellulose content of the unbleached and chlorinated pulps were obtained by means of the holocellulose determination in the cases of the unbleached and chlorinated pulps, but for all other pulps, by subtracting the sum of the lignin and the ether-soluble and ash contents from one. The fully bleached pulps were considered to be lignin-free.

Determination of sodium hypochlorite requirement.—The sodium hypochlorite requirement was determined by treating a series of samples of the extracted pulp with different amounts of hypochlorite under the conditions described above for the hypochlorite stage. The exact amount of hypochlorite required for the standard brightness of 82 ± 1 was then calculated from the ratios of hypochlorite applied to the brightness obtained in the test series. The requirement is expressed as per cent chlorine based upon the weight of unbleached pulp on the moisture-free basis.

Preparation of test sheets.—Test sheets for strength determinations were formed on a 7- by 9-inch sheet mold from suspensions in tap water at a consistence of 0.2 per cent. After couching, the wet sheets, with top and wire surfaces between mimeograph paper followed by blotting paper, were pressed at 25 pounds psi for 5 minutes, then at 50 pounds psi for 3 minutes. After pressing, the individual sheet units were clamped in drying frames and dried in a current of air at about 65 deg. C. Before testing, the sheets were conditioned at 50 per cent relative humidity and 75 deg. Fahr. On a ream size of 25 in. x 40 in.—500, the weight of the test sheets varied from 52 to 58 pounds.

Test sheets for the measurement of brightness were made in the manner just described, except that the wet sheets were pressed at about 10 pounds psi for 3 minutes and were allowed to dry at room temperature. When dry, these sheets were pressed between white bristol board for 15 minutes at about 175 pounds psi, and then the brightness was measured with a Hunter reflectometer calibrated in accordance with TAPPI Standard T217sm-42.

DISCUSSION OF RESULTS

Chlorination

As is well known, the action of water solutions of chlorine depends upon the hydrogen-ion concentration of the solution, because the concentration determines the composition of the solution. The most recent data in the latter connection appear to be those of White, McCarthy, and Hibbert (*23*) which show that below *p*H 2 the main component of the solution is elemental chlorine, at *p*H 5 the main component is hypochlorous acid, while above *p*H 7 the hypochlorite ion is the predominating form.

Values of the normal oxidation potential of these three forms of chlorine in water solution are given by Latimer and Hildebrand (*10*) as 1.50 volts for hypochlorous acid, 1.35 volts for

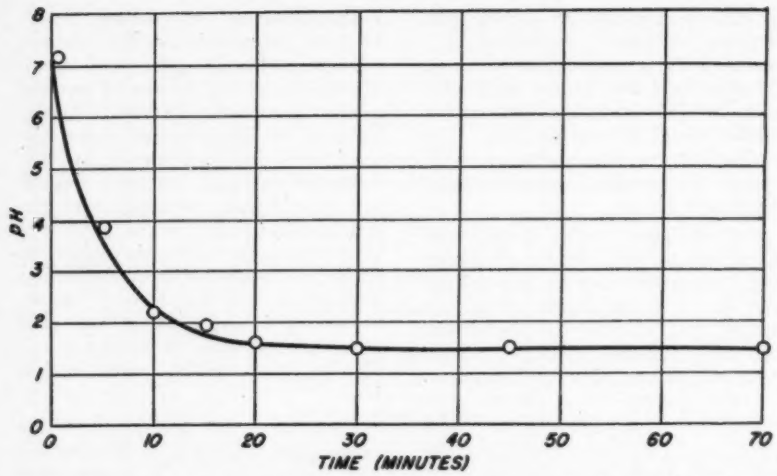


Fig. 1—Change in pH during chlorination of an aspen neutral sulphite semichemical pulp when 12 per cent gaseous chlorine was added in 24 minutes at a uniform rate

elemental chlorine, and 0.94 volt for the hypochlorite ion.

pH during experimental chlorination.—The time required to inject the chlorine, during chlorination of the experimental pulp, was 24 minutes. Figure 1 shows that a *p*H value of 2, at and below which elemental chlorine predominates, was not attained until about 12 minutes after injection was begun. Hence, during 50 per cent of the injection period, the chlorine was in the form of hypochlorous acid and, furthermore, a substantial portion of the chlorine was consumed during the 12-minute period, as is indicated by the chlorine consumption curve in Figure 2.

It might be expected that the action of the hypochlorous acid, with its oxidation potential of 1.5 compared to that of 0.94 for the hypochlorite ion, was one of oxidation during the period it was present. The chemistry of this acid reveals, however, that hydrochloric acid decomposes it to release free chlorine. Hanson (*5*) viewed it as a chlorinating agent on pulp containing lignin. From analogous theoretical considerations, Hatch (*6*) reached the conclusion that the action of hypochlorous acid on lignin in pulp is one of chlorination. Unpublished work of Hibbert and co-workers was cited by Hisey (*7*) to the effect that the action of chlorine on lignin in acid media is predominantly one of chlorination by substitution accompanied by demethoxylation. Although no definite evidence has been found that oxidation occurs under these conditions, there is the possibility that demethoxylation is partly a result of oxidation. For example, Larson (*9*) found that when the amount of chlorine was increased in chlorinating sulphite pulp, the amount of chlorine as hydrochloric acid in the reaction liquor increased. He attributed this to oxidation. Carmody and Mears interpret their results as indicating evidence of oxidation accompanying chlorination (*2*).

Rate of chlorine consumption.—Published information on the rate of consumption of the amount of elemental chlorine conventionally used in bleaching sulphite and sulphate pulps (*2, 6, 11*) shows it to be initially very fast and subsequently much slower. As much as 90 per cent of the chlorine added can be consumed in one-third to one-fourth of the total reaction time. From a study of reaction rates during chlorination over a range of *p*H and the resulting chloride concentration in the reaction mixtures, Carmody and Mears (*2*) concluded that two separate and distinguishable reactions involving different groups of the lignin occur. In the very fast part of the reaction the oxidizable groups of the lignin are attacked with other groups being reacted upon during the rest of the time. In acid medium, both of these reactions were considered to be mixtures of chlorination and oxidation. The oxidation occurring during chlorination with customary amounts of chlorine and the usual conditions, however, involves cellulosic material only incidentally, if at all, according to Loeschbrandt (*13*).

The rate of chlorine consumption of the hardwood semichemical pulp used in this study was measured upon the assumption that a comparison of this rate to those cited above for softwood sulphite and sulphate pulps would afford an indication whether or not there was a similarity in type of reaction.

The consumption rate was determined by adding practically instantaneously 12 per cent chlorine as chlorine water, based upon the pulp, to a series of pulp samples and stopping the reaction at predetermined intervals for determination of residual chlorine. These results are shown in Figure 2 where the per cent of chlorine consumed is related to the reaction time. This relation was also found to hold when chlorine, as chlorine water, was added to the pulp at the same rate at which the chlorine was injected in preparing the six batches of chlorinated pulp.

The curve in Figure 2 shows a very fast initial consumption rate, at which about 95 per cent of the chlorine was taken up in 15 minutes. For comparison, Loeschbrandt (*11*) reported a 75

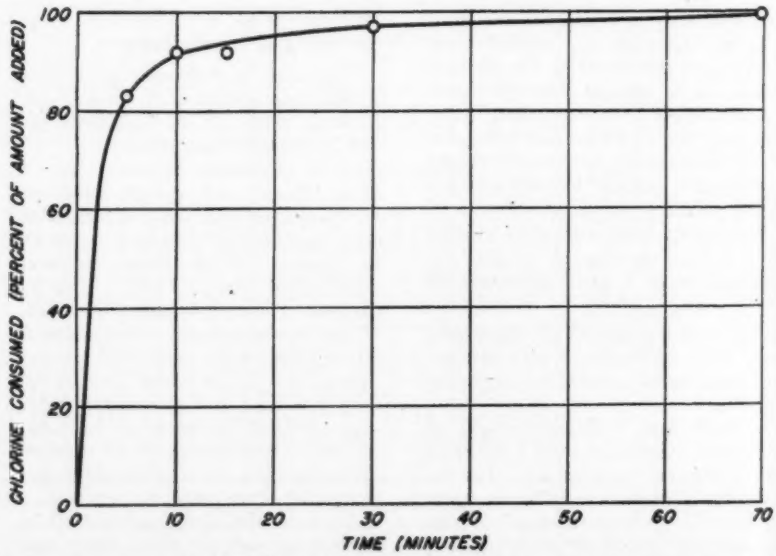


Fig. 2—Consumption of chlorine by an aspen neutral sulphite semichemical pulp when 12 per cent chlorine, as chlorine water, was added instantaneously

per cent consumption at 20 deg. C. for a sulphate pulp. It is to be expected, however, that rate will be affected by a number of factors. Results of Rue and Sconce (*19*) indicate that one of these factors is the relation between the amount of chlorine added and the chlorine requirement of the pulp. Another is temperature (*11*). Other possibilities are the amount and condition of the lignin in the pulp and the hydrogen concentration in the acid range. The similarity of the chlorine consumption rate for the aspen semichemical pulp to those of sulphite and sulphate pulps indicate the occurrence of the same type of reactions.

Chlorine content of the chlorinated pulp.—It will be recalled that the pulp before chlorination with 12 per cent chlorine, based upon the pulp, contained 11.6 per cent lignin. After chlorination, the moist, thoroughly washed chlorinated pulp contained 5.6 per cent lignin and 0.97 per cent chlorine based upon the pulp as shown in Table 1. Based upon the chlorinated lignin, the chlorine content would be 14.7 per cent.

Larson (*9*) found that upon chlorinating a sulphite pulp containing 15.2 per cent lignin with 14.7 per cent chlorine, the moist chlorinated pulp contained 5.44 per cent lignin and 0.74 per cent chlorine. Based upon the lignin, the chlorine content in this instance would be 13.6 per cent.

In the foregoing two instances, the ratio of the amount of chlorine added to the amount of lignin in the unbleached pulp was essentially the same and, therefore, it would appear that the close agreement in the chlorine content of the chlorinated pulps based upon their lignin contents is more than a mere coincidence. It might be taken as an indication of similarity between the water-insoluble portions of the chlorinated lignins in the two pulps.

It is not known whether all of the residual lignin in the chlorinated pulp was but partially chlorinated or whether only a part of it was completely chlorinated. It is thought unlikely, however, that all of it was completely chlorinated because Larson (*9*) found the water-soluble chlorinated lignin to contain 21.25 per cent chlorine. Furthermore, when isolated lignins have been chlorinated in water suspension, chlorine contents ranging from 18 to 46 per cent have been found (*1, 8, 12, 16*).

It was concluded that the aspen semichemical pulp was not overchlorinated. Possibly it was somewhat underchlorinated.

Loss of pulp upon chlorination.—

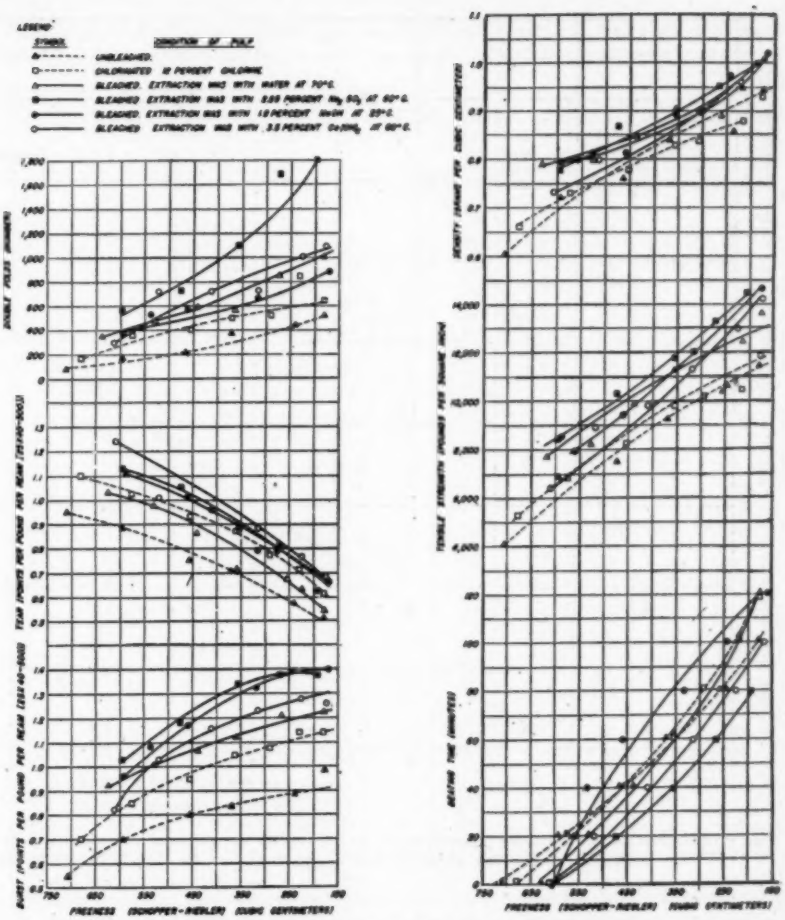


Fig. 3—Strength development of unbleached, chlorinated, and bleached aspen neutral sulphite semichemical pulp, the bleached pulps representing four different extraction treatments

The average yield of chlorinated pulp obtained from the six lots of pulp was 89.3 per cent of the unbleached pulp, with the individual values being 90.0, 89.1, 90.0, 86.9, 89.8 89.8. When corrected for the chlorine content of 0.97 per cent, the average yield of pulp after chlorination was 88.4 per cent. The loss, by difference, was, therefore, 11.6 per cent.

The lignin content of the unbleached pulp was 11.6 per cent and that of the chlorinated pulp was 5 per cent, based upon the unbleached pulp. Thus 6.6 parts of lignin, corresponding to 57 per cent of the original amount, were removed by chlorination with 12 per cent chlorine. Larson (*9*) found that 69 per cent of the original lignin was removed from a high-lignin-content acid sulphite pulp with essentially this same chlorine-lignin ratio, a fact that may indicate that lignin in the neutral sulphite semichemical pulp is more resistant to chlorination than the sulphonated lignin in sulphite pulp. It is generally believed that the sulphonated lignin in unbleached sulphite pulp is less resistant to chlorination than the lignin in sulphate pulp. Possibly the lignin in the neutral sulphite semichemical pulp lies between these two with respect to resistance to chlorination.

The loss other than lignin, determined by difference, was, as shown in Table 2, 5 per cent. This fraction was chiefly cellulosic material. It included 0.1 per cent of ether-soluble material and 0.54 per cent ash, so the apparent loss of cellulosic material was about 4.4 per cent. Upon the basis of alpha-cellulose contents of total cellulose isolated from the unbleached and chlorinated pulps by the holocellulose procedure, there was no loss in alpha-cellulose.

Chlorination of the unbleached pulp with up to 20 per cent chlorine indicated that with this amount of chlorine the yield of chlorinated pulp would be about 84 per cent and the residual lignin content would be about 0.8 per cent, based upon the unbleached pulp.

Strength of the chlorinated pulp.—The results of the pulp strength tests given by Figure 3 show an improve-

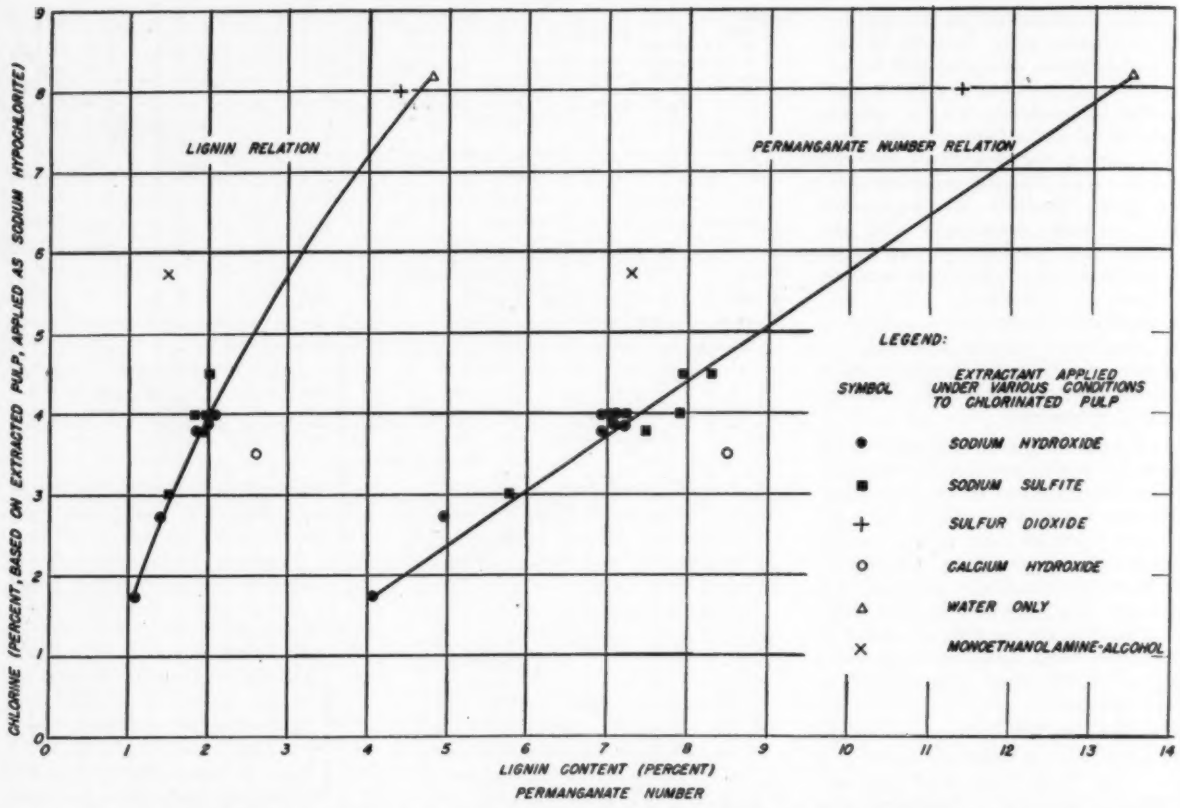


Fig. 4—Relation of the chlorine requirement of extracted aspen neutral sulphite pulp to the lignin content and the permanganate number when the chlorine was applied as sodium hypochlorite to attain a brightness of 82 ± 1

ment in pulp strength upon the removal of an appreciable quantity of lignin. At a freeness of 550 cubic centimeters, Schopper-Riegler, the improvement amounted to about 19 per cent in bursting and tearing, 10 per cent in tensile and 100 per cent in folding strengths.

Effects of Extraction and Hypochlorite Treatments

Conditions for all of the extraction and hypochlorite treatments and the corresponding data for pulp yields and chemical and physical characteristics are given in Table 1. Values in this table for chemical components are expressed as percentages of the pulps analyzed. The hypochlorite requirements of extracted pulps and expressed as per cent of chlorine based upon the unbleached pulp and applied as hypochlorite to attain the standard brightness. For convenience, the hypochlorite treatment will be referred to as oxidation. Chlorine requirements of the extracted pulps in relation to their lignin contents and permanganate numbers are shown graphically in Figure 4. In these graphs, chlorine requirements are based upon the extracted pulps rather than upon the unbleached pulp because the values for lignin content and permanganate number refer to extracted pulps.

Losses of lignin and cellulosic material resulting from each treatment are shown in Table 2. Percentage values given there were derived from the yield and analytical data of Table 1, and are based upon the unbleached pulp. The values for ash content and ether solubility show that the losses of mineral matter and ether-soluble material were small in comparison to the total loss of pulp material resulting from the various treatments. Because of this and for convenience, all loss other than lignin was assumed to be cellulosic material. In addition, it was considered that any lignin remaining after oxidation would be so small as to preclude accurate measurement.

Losses in alpha-cellulose are not reported in Table 2 because of the discrepancies among the alpha-cellulose values for the unbleached pulp and the derived values in Table 2. Although losses in alpha-cellulose could not be calculated from these values, they are used to indicate degradation in certain instances.

Extraction with Water

When the chlorinated pulp was extracted with water at 70 deg. C. for 1 hour, a treatment which could be considered as an exaggerated degree of washing, the total loss, assuming the extracted pulp was free of chlorine, was 1.1 per cent, as shown by the yield values in Table 1. The loss in lignin was 0.8 per cent and other losses negligible, as shown in Table 2.

Pulp freeness was lowered somewhat by the extraction and the folding strength of the unbeaten pulp was doubled, but the other strength properties were essentially unchanged.

The chlorine requirement, as hypochlorite, of the extracted pulp was 7.25 per cent, which was excessively high in comparison to the requirement when sodium hydroxide was used as the extractant. The total loss due to the hypochlorite treatment was 5.3 per cent, of which 4.2 per cent was accounted for by the lignin removed. The fact that the alpha-cellulose content was lowered 1.9 per cent, is evidence of excessive oxidation resulting from the amount of hypochlorite used. Apparently this degradation was not entirely one of solubilization of cellulose since the total cellulosic loss was less than 1.9 per cent.

Oxidation had no effect upon the tearing and folding strength of the water-extracted pulp in the unbeaten condition, but did increase bursting

and tensile strengths 29 and 53 per cent, respectively. Compared at 550 cubic centimeters freeness, after beating, the water-extracted and fully bleached pulp was no higher in tearing strength than the chlorinated pulp before extraction, but averaged about 20 per cent higher in the other strength properties. Strength-development curves for these two pulps are shown in Figure 4.

Extraction with Monoethanolamine

Extraction with alcoholoc monoethanolamine followed by washing only with alcohol removed about 3.8 per cent lignin. The yield values in table 1 show a total loss in weight of only 2.1 per cent due to this treatment. Possibly both experimental error and retention of alcohol and ethanolamine by the pulp contributed to this discrepancy. The results indicate that 1.7 per cent of cellulosic material was removed by washing with water at a temperature of 0 deg. C. There was no appreciable increase in pulp strength upon extraction.

In the oxidation of the extracted pulp, the total loss was 2.3 per cent, of which 1.2 per cent was lignin and, by difference, 1.1 per cent was cellulosic material, which loss is much the same as occurred upon oxidation of the water-extracted pulp.

The fully bleached pulp in the unbeaten condition was 25 per cent higher in bursting and 36 per cent higher in tensile, but essentially the same in folding and tearing strengths as the extracted pulp. This strength increase was somewhat less than occurred in bleaching the water-extracted pulp.

Extraction with a Water Solution of Sulphur Dioxide

With respect to amount of material removed, the result of extraction with a water solution of sulphur dioxide was essentially the same as that with water alone. As occurred in the extraction with water, unbeaten pulp freeness was lowered somewhat and folding strength was doubled, but the other strength properties were essentially unchanged upon extraction with sulphurous acid. The chlorine requirement, as hypochlorite, of the extracted pulp was, like that of the water-extracted pulp, excessively high in comparison to chlorine requirements after extraction with sodium hydroxide. As shown by the curves in Figure 3, the chlorine requirement relates well with lignin content, but not the permanganate number.

The total loss in oxidation was 7.6 per cent, of which 3.8 per cent was lignin. The loss in cellulosic material

TABLE 2—Pulp losses and alpha-cellulose contents resulting from various treatments of an aspen neutral sulphite semichemical pulp

Pulp treatment	Bleach		Bleaching treatment			Pulp losses			Alpha cellulose[1]
	No.	Stage	Agent	Amount	Temperature	Total	Lignin removed	Total cellulose	
				Percent[3]	° C.	Percent[3]	Percent[3]	Percent[3]	Percent[3]
Chlorination	1 to 19	1	Chlorine	12.0	24	11.6	6.6	5.0	64.0
Extraction	1	2	Water	.....	70	1.1	.8	.3	66.2
Oxidation	1	3	Sodium hypochlorite	7.25	38	5.3	4.2	1.1	63.3
Extraction	2	2	Monoethanolamine[4]	1.0	70	2.1	1.8	.....	63.0
Extraction	2A	2	Monoethanolamine[4]	.....	0	3.5	1.8	1.7	.....
Oxidation	2	3	Sodium hypochlorite	4.75	38	3.3	2.2	1.1	62.2
Extraction	3	2	Sodium sulfite	1.35	80	3.4	2.7	.7	66.7
Oxidation	3	3	Sodium hypochlorite	3.85	38	3.5	2.7	1.8	63.2
Extraction	4	2	Sodium sulfite	1.35	80	3.5	3.4	.1	66.8
Oxidation	4	3	Sodium hypochlorite	3.80	38	3.6	2.6	1.6	63.2
Extraction	5	2	Sodium sulfite	1.35	60	3.6	3.3	.3	64.8
Oxidation	5	3	Sodium hypochlorite	3.46	38	3.8	1.7	2.1	63.3
Extraction	6	2	Sodium sulfite	1.35	80	3.4	3.2	1.2	64.5
Oxidation	6	3	Sodium hypochlorite	3.1	38	3.4	1.7	1.7	62.5
Extraction	7	2	Sodium sulfite	2.25	80	4.7	3.7	1.0	64.6
Oxidation	7	3	Sodium hypochlorite	2.50	38	1.9	1.3	.6	64.1
Extraction	8	2	Sodium sulfite Sodium hexameta-phosphate	1.35 .5	60	3.7	3.4	.3	64.4
Oxidation	8	3	Sodium hypochlorite	3.39	38	3.8	1.6	2.2	63.3
Extraction	9	2	Sulfur dioxide	1.8	60	.9	1.2	.....	64.4
Oxidation	9	3	Sodium hypochlorite	7.0	39	7.6	3.8	3.8	61.6
Extraction	10	2	Sodium hydroxide	.9	25	5.0	3.3	1.7	65.1
Oxidation	10	3	Sodium hypochlorite	3.3	38	3.4	1.7	1.7	.....
Extraction	11	2	Sodium hydroxide	1.8	25	6.3	3.8	2.5	64.4
Oxidation	11	3	Sodium hypochlorite	2.25	38	2.2	1.2	1.0	62.3
Extraction	12	2	Sodium hydroxide	.9	60	5.2	3.3	1.9	64.1
Oxidation	12	3	Sodium hypochlorite	3.3	38	3.1	1.7	1.4	62.0
Extraction	13	2	Sodium hydroxide	.9	80	5.0	3.3	1.7	63.6
Oxidation	13	3	Sodium hypochlorite	3.3	38	2.8	1.7	1.1	62.9
Extraction	14	2	Sodium hydroxide	.9	60	5.2	3.3	1.9	62.8
Oxidation	14	3	Sodium hypochlorite	3.25	38	3.0	1.7	1.3	62.6
Extraction	15	2	Sodium hydroxide	.9	70	6.2	3.4	2.8	62.7
Oxidation	15	3	Sodium hypochlorite	3.1	38	1.8	1.6	.2	63.3
Extraction	16	2	Sodium hydroxide	3.5	85	7.2	4.0	3.2	62.0
Oxidation	16	3	Sodium hypochlorite	1.4	38	3.2	1.0	2.2	61.5
Extraction	17	2	Sodium hydroxide	3.5	25	8.1	4.1	4.0	62.7
Oxidation	17	3	Sodium hypochlorite	1.2	38	.9	.9	.0	62.6
Extraction	18	2	Sodium hydroxide	3.5	85	9.6	4.1	5.5	63.2
Oxidation	18	3	Sodium hypochlorite	1.2	38	1.2	.9	.3	60.8
Extraction	19	2	Calcium hydroxide	3.5	60	3.3	2.6	.8	63.7
Oxidation	19	3	Sodium hypochlorite	2.25	38	4.2	2.2	2.0	.....
Extraction	20	2	Calcium hydroxide	3.5	60	3.3	2.8	.5	63.7
Oxidation	20	3	Sodium hypochlorite	3.0	38	.....	.....	.....	.....

1 Calculated from results obtained by the direct gravimetric method.
2 Values were obtained by difference and include small amounts of mineral matter and ether-soluble material.
3 Based on the weight of unbleached pulp.
4 An alcoholic solution of monoethanolamine. The extracted pulp was washed only with 95 per cent alcohol.
5 A portion of the washed pulp from the preceding extraction was washed with water at 0 deg. C.
6 The lignin contents of the extracted pulps were estimated from a lignin-chlorine relation.

was thus 3.5 times greater than occurred in the oxidation of the pulp extracted with water. On the same basis of comparison, the alpha-cellulose content was 1.7 per cent lower. The greater loss of cellulosic material probably resulted from the more acid condition during extraction with sulphurous acid compared to the extraction with water. Upon oxidation, the unbeaten-pulp freeness was lowered markedly and bursting, tensile, and folding strengths were increased 37, 26, and 100 per cent, respectively, with tearing strength essentially unchanged.

Extraction with Sodium Sulphite

Extraction with 1.35 per cent sodium sulphite, based upon unbleached pulp, removed a little more than 3 per cent of the lignin over the temperature range of 40 deg. to 70 deg. C., which left about 2 per cent lignin in the extracted pulp. The amount of lignin removed was therefore slightly less than that taken out by the alcoholic amine solution, but was from about three to four times more than that removed by extraction with sulphurous acid or water. With 2.25 per cent sodium sulphite at a temperature of 60 deg. C., 3.7 per cent lignin was removed, which left 1.5 per cent lignin in the extracted pulp.

Initially, the conditions in these extractions with sodium sulphite were essentially neutral. At the end they were mildly acid, with the minimum *p*H value measured being 6.2. In the extraction with sulphurous acid, the initial and final *p*H values were 3.4 and 2.8, respectively. Furthermore, on a weight basis, there was only one-third to two-thirds the amount of sulphite ion present in the extractions with sodium sulphite as was present in the extraction with sulphurous acid. The increased removal of lignin by sodium sulphite compared to sulphurous acid may be attributed either to greater solubilizing action of the sulphite ion on the chlorinated lignins at a *p*H of 6.2 than at a *p*H of 3.1, or to the possible solubilizing action of the sulphite ion in conjunction with the sodium ion. It is natural to

recognize the possibility of improving the action of sodium sulphite by the use of a buffer to maintain a mildly alkaline condition during extraction.

With 1.35 per cent of sodium sulphite the loss of cellulose increased progressively as the temperature of extraction increased, with increment being greatest between 60 deg. and 70 deg. The maximum loss was 1.1 per cent. With 2.25 per cent of the sulphite at 60 deg. C., the loss of cellulosic material was 1 per cent. In this instance it appeared that slightly more lignin was removed than in the extractions with 1.35 per cent sulphite.

The data for the alpha-, beta-, and gamma-cellulose contents of the extracted pulps are inconclusive due to the discrepancies previously mentioned. A comparison, however, of the lowest value for alpha-cellulose reported for the extracted pulps to those for the chlorinated pulp before and after extraction with water indicates that no degradation of alpha-cellulose occurred.

The freeness of the pulp in the unbeaten condition was lowered as much as 110 cubic centimeters by extraction with sodium sulphite. Bursting and tensile strengths were increased in the range of 25 to 30 per cent and tearing strength about 10 per cent, and the folding strength was doubled.

In the extraction series with 1.35 per cent sodium sulphite, the chlorine requirement, as hypochlorite, decreased progressively to a maximum of 20 per cent as the temperature was increased to 70 deg. C. Since the amount of lignin removed was constant, it is evident that other oxidizable material was taken out. The chlorine requirement after extraction with 2.25 per cent sulphite at 60 deg. C. was about 36 per cent lower than that after extraction with 1.35 per cent sulphite at the same temperature. As shown in Figure 3, the hypochlorite required for fully bleaching this type of pulp after extraction with sodium sulphite can be estimated with fair accuracy from either the lignin content or the permanganate number, at least in the lignin-content range of 1 to 2.5 per cent.

Loss of cellulose upon oxidation of the pulps after extraction with 1.35 per cent sodium sulphite was about 1.8 per cent compared to a loss of 3.8 per cent for the pulp extracted with sulphurous acid. The cellulose loss for the pulp extracted with 2.25 per cent sulphite at 60 deg. C. was only 0.6 per cent. It would be expected that the value should be lower than the loss upon oxidation of the pulp extracted with 1.35 per cent sulphite at 60 deg. C. to which was applied 36 per cent more chlorine, but this value is considered to be additionally low due to experimental error. There was no indication of degradation of alpha-cellulose upon oxidation with 2.5 per cent chlorine, but there was an apparent small loss in this component upon treatment with 3 to 4 per cent chlorine.

The freeness of the pulp was not changed appreciably upon full bleaching except in one instance where decrease of 130 cubic centimeters occurred. Pulp strength in the unbeaten condition was raised to a higher level than in the preceding extractions. Although tearing strength was not affected, bursting and tensile strengths were increased in the range of 50 to 60 per cent, and the folding strength, 15 per cent.

Extraction with 2.25 per cent sodium sulphite at 60 deg. C. gave a material having the lowest chlorine requirement and as high a yield of bleached pulp as any obtained in the series. Furthermore, the over-all strength of the bleached pulp in the unbeaten condition was the highest in this series. The results of the beater test given in Figure 4 show that it developed unusually high folding strength, high bursting and tensile strengths, and that the tearing strength held up well. The blister test (4) indicated very high hydration after 60 minutes of beating. At this point the freeness was 270 cubic centimeters, Schopper-Riegler, and the tearing strength very good for this freeness.

An extraction trial using 0.5 per cent sodium hexametaphosphate in conjunction with 1.35 per cent sodium sulphite at 60 deg. C. gave results essentially the same as those in the corresponding extraction without the phosphate.

Extraction with Sodium Hydroxide

In the extractions with 0.9 per cent sodium hydroxide at 10 per cent consistence, 3.3 per cent of lignin was removed over the temperature range of 25 deg. to 70 deg. C. About the same amount was removed by 1.35 per cent sodium sulphite over the temperature range of 40 deg. to 70 deg. C. With 1.8 per cent caustic at 10 per cent consistence and 25 deg. C., slightly more lignin was removed than by 0.9 per cent caustic. With 3.5 per cent caustic at 12 per cent consistence, no more lignin was removed at 85 deg. C. than at 25 deg. C. The indication is that with the use of a practicable amount of caustic in the extraction stage, an elevated temperature is of no advantage with respect to removal of lignin. With 3.5 per cent caustic at 85 deg. C., the same amount of lignin was removed at densities of 6 and 12 per cent.

In the determination of the alpha-cellulose content of the chlorinated pulp by the direct method of analysis, where the amount of caustic applied was 65 per cent of the weight of the sample, 4.4 per cent lignin (based upon the unbleached pulp) was removed. In the extraction series, 1.8 to 3.5 per cent caustic (based upon the unbleached pulp) removed 4 per cent lignin. It therefore appears there is no economy in using more than about 2 per cent caustic for extraction where the amount of chlorine applied is approximately equal to the lignin content of the pulp.

The cellulosic loss with 0.9 per cent caustic was about 1.8 per cent above the temperature range of 25 deg. to 60 deg. C., but was increased about 1 per cent at 70 deg. C. to become equal to the loss with 1.8 per cent caustic at 25 deg. C. With 3.5 per cent caustic at high density, the cellulose losses were 4 per cent at 25 deg. C. and 5.5 per cent at 85 deg. C., but at the lower density, and consequently lower concentration of caustic, the loss at 85 deg. C. was lower, being 3.2 per cent. The values for alpha-cellulose indicate that with increasing temperature and amount of caustic there was some degradation of this component.

After the extractions with sodium hydroxide, the freeness of the pulp in the unbeaten condition was lower and the strength higher. The increase in strength was of the order of 25 to 30 per cent for bursting and tensile and 150 per cent for folding strengths. Tearing strength was, in general, not changed except by the extraction with 3.5 per cent caustic at 6 per cent density and 85 deg. C., where there was an increase.

The chlorine requirement, as hypochlorite, was not affected by temperature, but it was inversely proportional to the amount of caustic applied. As shown in Figure 3, it appears that the hypochlorite required for fully bleaching this type of pulp after caustic extraction can be estimated fairly well from the permanganate number.

The yields of the bleached pulps after the caustic extraction treatments were essentially the same, except for those in which 3.5 per cent caustic was used, for which the yields were about 2 per cent lower.

Upon oxidation of the pulps extracted with 0.9 per cent sodium hydroxide at various temperatures, the bursting, tensile, and folding strengths of the pulps in the unbeaten condition were increased in the range of 20 to 40 per cent, but were not relatable to the extraction temperature. The

tearing strength of the bleached pulps in this series was a little lower than that of the corresponding extracted pulps.

With increasing amounts of caustic at high density, there was an indication of an adverse effect upon the strength of the bleached pulp and that this effect may be minimized by lowering the concentration of the extractant through lowering the density.

It appears from a comparison of the chlorine requirements, yield, and quality of the bleached pulps that amounts of caustic in the range of 1 to 2 per cent and at a temperature of 25 deg. C. are satisfactory for the extraction stage in the bleaching of semichemical pulp of this character.

Extraction with Lime

The *p*H value during the extractions with 3.5 per cent of lime at 60 deg. C., was about the same as that during extraction with 1.8 per cent sodium hydroxide at 25 deg. C., but the amount of lignin removed was less. The extracted pulp required more washing to remove the colored material amenable to washing than did the pulp extracted with caustic. Arnold (*1*) observed that sodium hydroxide dissolved at least 100 per cent more chlorinated lignin than did lime. The increase in the ash content of the pulp upon extraction was attributed to an insoluble calcium-lignin complex (*1, 16*) and calcium carbonate.

Strength tests of the extracted pulp in the unbeaten condition showed a decrease in bursting, tearing, and folding strengths compared to the chlorinated pulp, with the actual strength being approximately the same as that of the unbleached pulp. The loss in the pulp strength may have been due to the comparatively high mineral content.

The chlorine requirement, as hypochlorite, of the lime-extracted pulp was 32 per cent higher than that of the pulp extracted with 1.8 per cent sodium hydroxide, due, partly at least, to its higher lignin content. It did not, however, follow the same relation to lignin content and permanganate number as shown for the other pulps in Figure 3.

For comparison, the lime-extracted pulp was treated with the same amount of hypochlorite (2.25 per cent available chlorine) that was required to bring the pulp extracted with 1.8 per cent caustic to the standard brightness of 82 ± 1. The resultant brightness was 74.6, there was no improvement in yield of bleached pulp, and the shives were practically unbleached. When the extracted pulp was bleached to 82 brightness, which required 3 per cent chlorine as hypochlorite, the shives were not bleached satisfactorily, in contrast to completely bleached shives in the pulp that had been extracted with sodium hydroxide. The strength development curve for the pulp at 74.6 brightness, given in Figure 4, shows that this treatment had no advantage in this respect over the pulp extracted with sodium hydroxide or sodium sulphite.

TABLE 3—Influence of extraction conditions on the amounts of materials required in the preparation of one ton of bleached aspen neutral sulphite semichemical pulp by a multistage process

Extraction treatment[1]			Materials			
Chemical	Amount	Temperature	Unbleached pulp	Chlorine		Extractant
				Elemental[2]	As sodium hypochlorite	
	Percent	°C.	Pounds	Pounds	Pounds	Pounds
Water	—	70	2,440	293	177	—
Sodium sulfite	1.35	40	2,445	294	94	33
Do.....	1.35	60	2,470	297	84	33.5
Do.....	1.35	70	2,482	298	75	33.6
Do.....	2.25	60	2,445	294	61	55.0
Sodium hydroxide	.9	25	2,500	300	83	22.5
Do.....	.9	60	2,500	300	81	22.5
Do.....	.9	70	2,486	298	77	22.2
Do.....	1.8	25	2,500	300	56	45.0
Do.....	3.5	25	2,564	308	31	89.0

1 Extractions were made at a density of 10 per cent for a period of 1 hour. Percentage values are based on the weight of unbleached pulp which contained 11.6 per cent lignin.
2 Twelve per cent based on the weight of unbleached pulp.

OTHER COMPARISONS OF EXTRACTION TREATMENTS

Material Balance

The material balance per ton of bleached pulp for the extractants water, sodium sulphite, and sodium hydroxide, shown in Table 3, affords a convenient summarizing comparison of the influence of the extractant, its amount, and the temperature upon yield and chlorine requirement. This comparison is necessarily restricted to the material studied; namely, an aspen neutral sulphite semichemical pulp containing about 12 per cent lignin and bleached by the three-stage process. Although sodium hypochlorite was used in the third stage, calcium hypochlorite is considered to be equally satisfactory.

To be complete, comparison based upon a material balance should include cost calculations. Furthermore, when dealing with a material balance in pulp bleaching, the important factor of pulp quality must be considered at the same time. In the case of bleached semichemical pulp the quality depends upon how well the shives and dirt have been bleached and the degree and rate of strength development upon beating. Due to the fact that the cost of bleaching materials and steam is not uniform among mills and to the fact that the production cost of the unbleached pulp can be estimated even less accurately, these calculations have not been included. Should it be desired, however, to arrive at a rough estimate in this connection, a cost of $35 per ton for unbleached pulp is thought to be a reasonable one.

Influence of Extractants Upon Losses

Yields of fully bleached pulps obtained from the pulps extracted with water and sodium sulphite were 2 per cent higher than those obtained from the pulps extracted with sodium hydroxide and calcium hydroxide. An amount of 7.25 per cent chlorine as sodium hypochlorite was applied to the water-extracted pulp, up to 3.85 per cent to the sulphite-extracted pulp, and as little as 2.25 per cent to the caustic-extracted pulp. Despite this wide variation in the amount of hypochlorite, the losses of cellulosic material upon oxidation, which did not exceed 2 per cent, can be considered nearly the same when obviously low values are discounted. Upon this basis, reasonable average

values for losses upon treatment with hypochlorite are taken as 1.1, 1.5 and 1.3 for the water-, sodium sulphite-, and caustic-extracted pulps, respectively. With the exclusion of the cellulosic losses upon extraction with 3.5 per cent caustic, which was shown to be an unnecessarily high amount, the average loss in the caustic extractions was 2.7 per cent compared to 1.4 per cent in the sulphite extractions. Therefore, the lower yield of bleached pulps from the caustic-extracted material is accounted for by the greater loss of cellulosic material during extraction.

A gain of 2 per cent in pulp yield is, of course, important only if it can be achieved economically. In any instance where there is a possibility that sodium sulphite can meet this economical requirement as an extractant in bleaching semichemical pulp, it should be given consideration.

Quality of Fully Bleached Pulps

Under the extraction conditions used in this study, the shives in the sulphite-extracted pulps were not entirely bleached, whereas they were in the caustic-extracted pulps. In comparison, however, to the bleached aspen neutral sulphite pulps that have been obtained in successful mill trials (*4, 14*), the shives were bleached satisfactorily for glassine and book papers.

When fully bleached, the bursting, tearing, and tensile strengths of the sulphite- and caustic- extracted pulps were essentially the same. The folding strength and the hydration rate of the sulphite-extracted pulp, however, were much higher than those of the caustic-extracted pulp. Furthermore, at the point of very high hydration, as indicated by the blister test (*4*), the tearing strength of the sulphite-extracted pulp was very good.

Upon the basis of the limited results of the present study, sodium sulphite offers definite possibilities as an extractant in the bleaching of semichemical pulp from the standpoint of both yield and quality of the bleached pulp.

CONCLUSIONS

In the multistage chlorine bleaching of aspen neutral sulphite semichemical pulp, it can be expected that chlorination with an amount of chlorine equal to the lignin content will remove somewhat more than half of the lignin present in the unbleached pulp. The removal of lignin in this way releases water-soluble hemicellulosic material, which consequently cannot be retained under commercially practicable bleaching conditions. The amount of cellulosic material lost upon chlorination is greater than the sum of that lost in subsequent alkaline extraction and hypochlorite treatments unless the conditions in these stages are needlessly drastic. Special precautions are not necessary to prevent loss of alpha-cellulose in the chlorination stage.

As in the chlorination stage, loss of some cellulosic material is unavoidable in the extraction stage under practical conditions.

Calcium hydroxide is not suitable as an extractant because of the high hypochlorite requirement of the extracted pulp and the unsatisfactory condition of the shives after treatment with hypochlorite. Furthermore, there is no compensatory advantage in pulp strength.

A mildly acid condition obtains during extraction with water at high temperature due to release of chlorine from the chlorinated lignin. Under these conditions, a very small amount of lignin is removed, but with an attendant larger loss of cellulosic material. Under a more acid condition at high temperature, and by using the sulphite ion when supplied by sulphurous acid, the action on the chlorinated lignin is somewhat greater but, in addition, an incipient degradation of cellulose occurs that results in a comparatively high loss of cellulosic material upon subsequent treatment with hypochlorite. When the sulphite ion, as supplied by sodium sulphite, is used under a barely alkaline condition and over a wide range of temperature, however, the loss ratio becomes favorable in that 2.5 times more lignin than cellulosic material is removed. Under a definitely alkaline condition when obtained by using sodium hydroxide in a practicable amount and over a wide range of temperature, the loss ratio is somewhat less favorable compared to that for sodium sulphite, since the cellulosic loss is twice greater but lignin removal remains the same.

When either sodium sulphite or sodium hydroxide is used as the extractant, the chlorine requirement of the extracted pulp is lowered with increasing temperature of extraction which, further, has no apparent adverse effect upon the yield of bleached pulp. The influence of temperature is twice greater with sodium sulphite than with sodium hydroxide, however, apparently because most of the oxidizable material other than lignin that is removed by sodium hydroxide at room temperature, can only be affected by sodium sulphite at a high temperature.

In the practicable range and at the proper temperatures, increasing the amount of sodium sulphite or of sodium hydroxide lowers the chlorine requirement by about the same amount.

It appears that the chlorine requirement of the pulp for a brightness of 82 after extraction with either sodium sulphite or sodium hydroxide correlates sufficiently well with both the lignin content and permanganate number of the extracted pulp to warrant the use of either for estimating chlorine requirements. The permanganate number is to be preferred because the determination can be made quickly.

Sodium sulphite, when used as an extractant, offers more of a problem with respect to complete bleaching of shives in the subsequent treatment with hypochlorite than does sodium hydroxide. The condition of the shives in the bleached sulphite-extracted pulp of the present study, however, would not seriously limit its usefulness.

Sodium sulphite shows promise of being superior to sodium hydroxide as an extractant with respect to the folding strength and to the rate of hydration of the fully bleached pulp. The rate of hydration would be of importance in the manufacture of greaseproof and glassine papers.

For a pulp similar to the one used in the present study, the conditions of extraction with sodium sulphite, recommended as being in general satisfactory, are about 2.5 per cent sodium sulphite based upon the unbleached pulp at a consistence of about 10 per cent and a temperature of about 60 deg. C., with an extraction period of at least 1 hour. Upon the same basis, the conditions recommended for sodium hydroxide are from 1 to 2 per cent of the extractant based upon the unbleached pulp at a consistence of about 10 per cent and a temperature of 25 deg. C., with an extraction period of at least 1 hour.

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How Silica Reduction in Boiler Feedwater Improved Paper Mill Power Plant Operation

(Continued from page 1442)

feedwater heaters operate in parallel. Steam for feedwater heating is furnished from the 35-lb. steam header, and heater temperatures are held at 212 Fahr. or slightly higher.

The bark burning boilers consist of two Erie city vertical type two drum units with riveted drums and operates at 150 psi. Neither is provided with a superheater,, economizer, or steam purifier. Boiler No. 1, which has no waterwalls, is designed for 17,000 pounds per hour, and Boiler No. 2 with waterwalls is designed for 20,400 pounds per hour. These units are normally operated at 150 per cent rating. The bark burners also have continuous blowdown. Water for these boilers comes from the main power plant where it is treated through the hot process softener. Total steam production from these bark burners is approximately 25,000 pounds per hour.

Two B & W recovery boilers burning "black liquor" are operated at 435 pounds. Boiler No. 8 of this group is of sectional-header design, with riveted drums and cyclone separators, but has no superheater. The designed capacity of this boiler is 23,000 pounds per hour. Unit No. 9 is a two drum B & W Tomilson boiler with welded drums, conventional baffles in lieu of any steam purification devices, and operates with about 150 degrees of superheat. This boiler is designed for 65,000 pounds per hour. Both boilers operate at from 150 to 180 per cent rating, are equipped with waterwalls and continuous blowdown systems, but neither has an economizer section. They are supplied with treated water from the main power plant.

The total daily steam production averages 9,350,000 pounds consisting of 6,750,000 pounds from the main power plant, 2,000,000 from the recovery boilers, and about 600,000 pounds from the bark burners.

Power generating equipment consists of five turbines. Of these, three General Electric units operate at 430 pounds throttle pressure, one operating full-condensing, one non-condensing with extraction at 150 psi and 35 psi, while the third operates part-condensing with extraction at 150 psi and 35 psi. A fourth, 150 psi General Electric unit, operates full-condensing. The fifth is a 150 psi Westinghouse unit equipped with a low level jet condenser and is used only in an emergency. Total generating capacity is 12,000 kw.

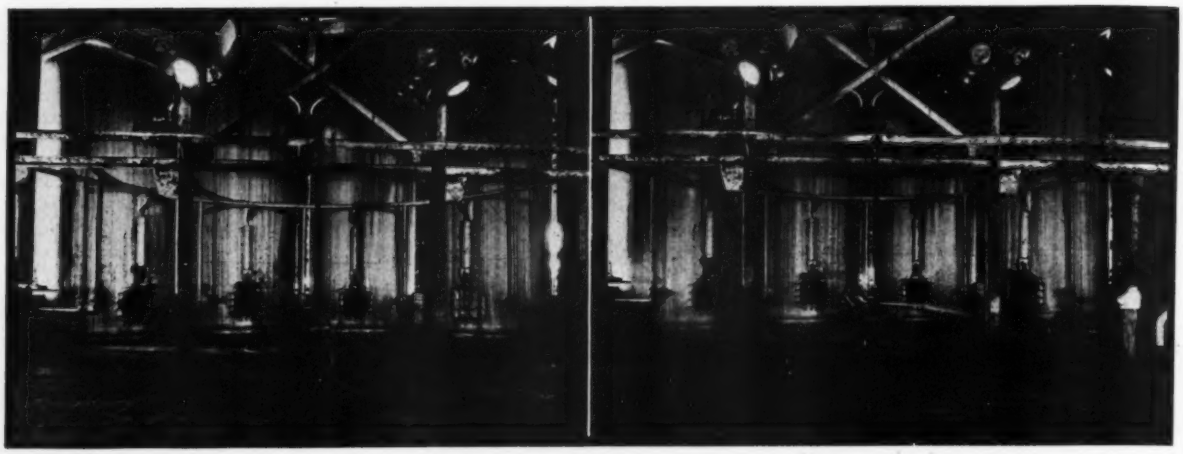
Auxiliaries

The three paper machines are equipped with Terry turbines. No. 1 machine has a single stage, 250 hp. booster unit and the No. 3 by two of the same type, all operating at 430 psi and exhausting into the 35 psi header which in turn provides steam for the paper dryers. Machine No. 2 is driven by a 600-hp. turbine of the same design, also exhausting into the 35 psi header. (See flow cycle Figure 2.)

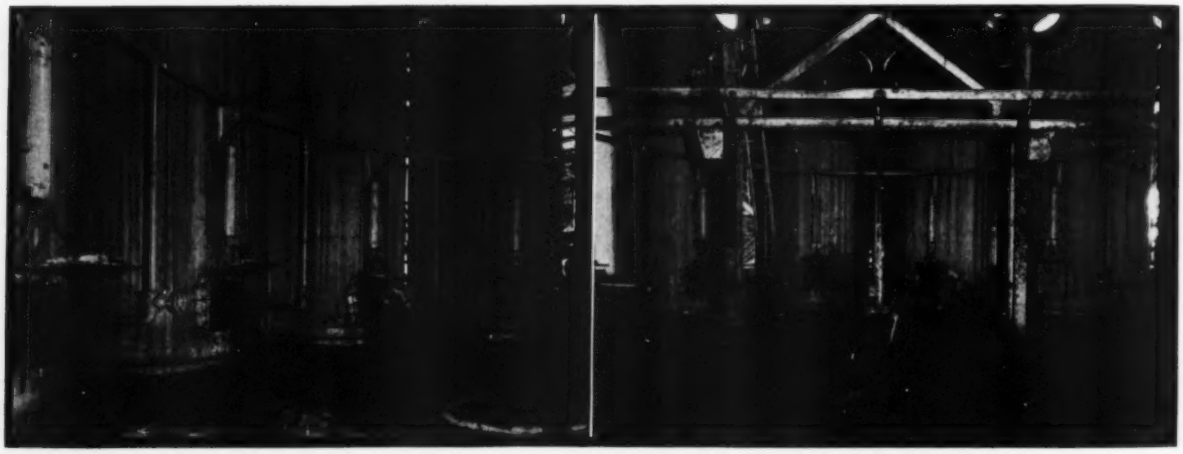
The induced and forced draft fans on boiler No. 9 are turbine-driven, the former equipped with a 250-hp. Terry single-stage unit, the latter a 170-hp. Terry single-stage unit. Both turbines operate at 430 psi and exhaust into the 35 psi header. The forced- and induced-draft fans on boiler No. 8 are motor-driven.

The boiler feed equipment consists of two three-stage high-pressure turbine-driven Allis-Chalmers pumps rated at 900 gpm. One four-stage high pressure turbine-driven Allis-Chalmers pump rated at 600 gpm. and one five-stage high pressure turbine-driven Warren boiler feed pump rated at 500 gpm. which is used as a standby. The high pressure pumps supply boiler feedwater for both the main power plant and the recovery boilers. Boiler feed equipment for the low pressure bark burners consists of one two-stage Warren pump and one three-stage Worthington pump. Both are low pressure pumps and are motor-driven.

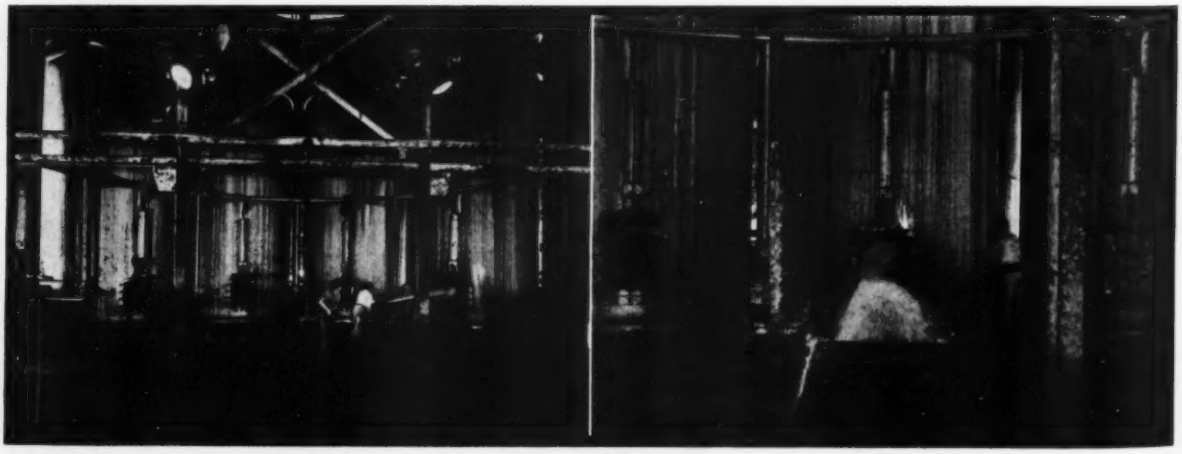
A Picture Story of Diffuser Operation



LEFT—Diffusers with open doors are empty. Wood grating in foreground covers a large stock chest . . . RIGHT—Pulp flowing from the diffuser just as door is opened



LEFT—Operator washing pulp from a diffuser . . . RIGHT—About two-thirds of a diffuser's capacity is discharged when its door is opened. Balance must be washed out. Operators wear a safety belt when this work is being performed



LEFT—Diffuser door plugged with pulp. Water being used to make stock flow . . . RIGHT—Cleaning diffuser screen after all pulp has been removed. (Photographs on this page reproduced through courtesy of Chicago Bridge & Iron Co.)

A Review of the Literature on Sizing

EDWIN SUTERMEISTER

AUTHOR'S NOTE: This review is the second prepared by the author; the first was published in 1933 in the *Paper Trade Journal*, and covered the available articles from about 1900 to 1932. The present review takes up the work where the first ended and brings it up to the early part of 1947.

▶▶▶ THIS WORK IS NOT A bibliography—no attempt has been made to list all of the papers published. This is partly due to space limitations; furthermore, other bibliographies are readily available. Another and more important reason is that not all the papers were within reach; in many instances the information obtainable was only that given in abstracts. Wherever these have been so brief as to give no details of the contents of the papers, it has been assumed that they were of minor importance and need not be included. In other cases it appeared that the subject matter was merely a rehash of old facts or a very minor variation of well-known procedures (especially in the case of patents) and these also have been omitted.

In this work, as in the former one, it has been attempted to classify the subject matter into a number of groups. This has been difficult because one paper often covers subjects which would normally fall into several different classifications. To avoid repetition, some papers have been reviewed partly in one group and partly in another. This may lead one to believe that a paper mentioned in one classification contains only the information noted—which may or may not be true. There seems to be no really satisfactory and foolproof method for listing papers which discuss more than one phase of this problem, even when each forms a major part of the paper, and when bits of information crop up more or less incidentally, it is still harder to tell how to handle them. The only suggestion which can be made is that the reader look under all possible classes where the information he wants might be found.

Another difficulty encountered is involved in the term "sizing." This seems to mean all things to all men, and it is used so broadly that a paper on sizing may include any operation from rosin beater sizing to surface sizing with starch, treating papers with asphalt, or impregnating with rubber or synthetic resins. With all the words in the dictionary available, and all the new words which are invented so freely, it seems a pity that the term "sizing" has become so overworked, but apparently it has gotten entirely beyond control. In the present paper the emphasis has been primarily on rosin sizing and secondarily on other processes designed to accomplish very similar results. There have been included, however, some of the more notable papers on other processes which do not necessarily impart resistance to water penetration, yet have been termed "sizing." These sections are necessarily much less complete than the main portion of the work, yet may be found of some interest.

The headings under which it has been attempted to classify the papers reviewed are as follows:

Literature reviews
Rosin
Size making; dry sizes; wax and miscellaneous
Fibers
Water
Alum; aluminates; acidity
Analysis and testing of sizes
Sizing tests and rosin determinations
Methods of sizing
Experimental data
Theoretical
Alkaline fillers
Silicate sizing
Starch sizing
Surface sizing

During the period covered by this review, the number of papers indicates that there is no lack of interest in the subject, and that there is still a sizing problem. It would seem that in the last 140 years there should have been time for a general shaking down to have taken place, so that the theories and mechanism of the sizing process should be universally understood. Instead of this, new theories are still being proposed, but none of the old ones completely abandoned, and we are apparently just as far from a general agreement as ever. It is certainly too big a problem for haphazard attacks to have much effect, no matter how good each individual piece of work may be, but, on the other hand, there seems to be no possibility of a well planned, all-around attack being made. Well-sized paper has been made in the past with only our limited knowledge available, and it looks as though most of us would have to muddle along in the same way in the future.

Literature Reviews

Since the publication of the "Review of the Literature of Sizing" by E. Sutermeister (*Paper Trade J.*, July 27, Nov. 23, Nov. 30, 1933, Jan. 4, 1934) which covered the years between 1900 and early 1932, there has been no attempt to make a compre-

hensive review of recent work, although each paper of any importance usually includes a fair number of references relating to the subjects discussed in the paper in question. Among such papers is that by E. Hochberger (*Papierfabr.* Feb. 17, 1935) who gives 100 references to the literature and discusses various phases of sizing. H. Hentschel (*Wochbl. Papierfabr.* 69 No. 25, 589 (1938)) also reviews the history and theory of sizing, mentioning the Bewoid and Gillet processes, the advantages of montan wax over rosin, and sizing with silicate-starch and by impregnation. (Unfortunately the full texts of these two papers are not available to the writer.)

R. W. Kumler (*Paper Trade J.*, March 11, 1937) reviews the patents relating to surface sizing with wax, and gives a classification of, and comments on, the methods of application.

Rosin

In distinction to the years previous to 1932 there seems to have been a very decided activity in the study of rosin as a basis for the preparation of new organic compounds, or of modified rosins having superior properties for sizing paper. This trend seems to have replaced the study of rosin as a unit substance, which was the chief basis of most of the investigations during the first thirty years of the century. The present method of attacking the problem seems likely to lead to sounder knowledge of rosin and a more complete insight into its potentialities as a sizing agent.

V. *Hodivoinu* (*Bul. chim. soc. române chim.* 35 11-16 (1934)) finds that Roumanian rosin from Picea excelsa compares favorably with American rosin. The potential supply was considered sufficient for domestic needs.

E. A. Georgi (*Paper Trade J.*, March 21, 1935) gives a good summary of the knowledge of rosin at the time of writing. After brief historical notes he discusses color, cleanliness, melting point, viscosity, acid, and saponification numbers, unsaponifiable material and solubility in gasoline and petroleum ether. The large number of rosin acids is mentioned, and the double salt of abietic acid—one molecule of sodium abietate to three molecules of abietic acid. Because of its slight solubility in water this salt may be expected to appear as fine crystals in any size containing appreciable amounts of free rosin.

W. C. Smith (*Ind. Eng. Chem. Anal. Ed.* Oct., 1937) finds that the saponification number of rosin is influenced by the solvent used in the determination; alcohols of higher molecular weight give higher saponification numbers.

F. Dennett and C. E. Libby (*Paper Trade J.*, Oct. 12, 1939) studied the sizing ability of suspensions of pure abietic acid in gelatin solutions, and with particle sizes varying from 226 to 688 millimicrons. Suspensions with an average particle size above 350 millimicrons gave lower sizing values, which decreased rapidly in the upper ranges of particle size. "H" grade rosin, suspended in the same way, had 83 per cent of the sizing ability of abietic acid of the same particle size. A high free rosin size—80 per cent free rosin—had 88 per cent of the sizing ability of abietic acid, and a nearly neutral size had about 49 per cent.

P. K. Baird and C. E. Curran (*Paper Trade J.*, Jan. 4, 1940) give a statistical survey of rosin in the paper industry, in which they review its history, uses in paper sizing, technological position, prospective demands, etc.

A. C. Dreshfield and J. H. Long (*Paper Trade J.*, July 17, 1941) discuss a hydrogenated rosin, called "Staybelite," which is much less likely to discolor than the original rosin. It is prepared by hydrogenation at high temperature and pressure in the presence of a catalyst. Its properties are given.

Size Making

In the former review a very considerable number of papers related to the combination of rosin and alkali in various proportions and under different conditions. Apparently activity along this particular line has slowed down very considerably, or possibly it is felt that knowledge of the reaction has become fairly well stabilized, for relatively few papers of this sort have appeared recently. Their place in the general interest has been taken by two other lines of investigation: the production of dry sizes which need not be dissolved before adding to the beater, and the utilization of paraffin, montan wax, or other miscellaneous materials, either alone or in combination with rosin size.

In the case of dry sizes it is to be noted that all the available information comes from patent specifications. The lack of any descriptive or controversial papers regarding such sizes might be taken to indicate that their use had not reached any great proportions in comparison with the older and more common type.

The situation with regard to waxes or other rosin substitutes or adjuncts is somewhat different. There has been a marked activity in patenting such sizes, but there have also been a number of papers of a general nature, which would tend to show a much wider interest than in regard to dry sizes. One gets the impression that montan wax is more highly regarded in Europe than in the United States.

It has been attempted to classify the size-making processes into three groups: (1) general, (2) dry sizes, and (3) waxes and miscellaneous materials. In each group the papers are arranged approximately chronologically.

General

O. Strecker (Ger. pat. 536472, Oct. 25, 1929) prepares a size by adding an ammonium salt, preferably the sulphate, to the rosin which has been dissolved in cold, very dilute caustic soda, and in such amounts that 50-100 per cent of the caustic soda is converted to sodium sulphate. This size is said to have a high content of free rosin.

In the Bewoid process, according to B. Wieger (*Wochbl, Papierfabr,* June 27, 1931) melted rosin is dispersed in an aqueous solution of a protective colloid to give the finest possible dispersion with the least possible alkali. He believes that only the molecular and colloidal dispersions effect sizing, coarse particles being ineffective. He also thinks that only aluminum resinate occurs. (Reference should also be made to U. S. pat. 1882680, Oct. 18, 1932). "Paper Mill Chemist" (*Paper Maker and British Paper Trade J.*, 82, No. 6 T. S. 29, 1931) considers that the sodium caseinate in the Bewoid size plays quite a different role from the starch, glue, or casein added to rosin size by previous methods.

Chintschin's sizing process (*Papierfabr,* 30 No. 5, 55 (Jan. 31, 1932)) is similar to the Delthirna. Lumps of rosin are dissolved in cold 0.5 per cent caustic soda solution until 40 grams per liter of rosin are present. Soda is added to the water when soft water is used.

C. Gillet (U. S. pat. 1853807, April 12, 1932) saponifies rosin in two distinct steps, first with a mixture of sodium carbonate and bicarbonate in ratio of 2 to 3, and in amount sufficient to saponify only part of the rosin. The preparation is finished in the second step by adding enough ammonia to saponify that part of the rosin unsaponified in the first stage. Ecke (*Papierfabr,* March 24, 1935) discusses the Gillet process and cites cases where its use has caused a saving in size.

E. J. Johnstone (U. S. pat. 1929115, Oct. 3, 1933) reduces the melting point of the rosin in the size by adding refined tall oil in quantity not over 30 per cent of the rosin.

R. Kern (U. S. pat. 1997366, April

9, 1935) prepares a rosin size emulsion comprising rosin, a substance to reduce the solidification point of the rosin (fatty oils, turpentine, high boiling alcohols and bile acids) and an emulsifying agent (preferably casein soap). The emulsion is then homogenized.

M. Krimmel (*Paper Trade J.*, July 4, 1935) discusses the losses which occur in making size and concludes that the total loss can be closely approximated by determining the loss in weight of the rosin on heating for 14 hours at 135-140 C., and adding to this the weight of carbon dioxide lost during saponification. A careful mill scale trial checked the theoretical figure very closely.

G. J. Manson (U. S. pat. 1990457, Feb. 5, 1935) emulsifies rosin by grinding it cold with clay, water, and alkali, preferably in the proportions of 85 rosin, 15 colloidal clay and 2 alkali, such as caustic soda.

B. W. Rowland (U. S. pat. 2116768, May 10, 1938) mixes with the rosin size 10-50 per cent of soy bean protein, based on the alkaline resinate, and allows it to stand until the protein has become dispersed and the alkali resinate has partially hydrolyzed, as indicated by increasing turbidity. (This has become known as the Prosize process.)

J. A. DeCew (U. S. pat. 2137239, Nov. 22, 1938) prepares a solution containing about 3 per cent ammonium resinate by mixing together at about 100 Fahr., 100 parts water, 3 parts pulverized rosin and enough ammonia to saponify the rosin.

Dry Sizes

Schafer (Aust. pat. 126434, April 15, 1931) saponifies rosin in the presence of a protective colloid and with a minimum amount of water. On cooling the size becomes solid and is capable of being emulsified.

I. G. Farbenindustrie Akt. Ges. (Ger. pat. 584490, July 2, 1931) prepares a dry size by melting 50 parts of carnauba wax having an acid number of 2, and 6.5 parts of a polyglycerine coconut oil ester, with 30 parts of water while stirring. This is mixed with 2.25 parts of caustic potash dissolved in 20 parts of water. For sizing, 2 parts of this dry size are added to 100 parts of dry paper stock in the beater and the wax is precipitated by alum.

For making dry size to add to the paper stock, A. C. Dreshfield (U. S. pat. 1836455, Dec. 15, 1931) mixes about two parts of alum and one part of saponified rosin in the form of an impalpable powder. In another method for preparing dry, powdered, saponified rosin size the Paper Makers Chemical Corp. (Brit. pat. 468450, Jan. 6, 1936) adds about 1 per cent of an antioxidant, preferably during saponification.

American Cyanamid & Chem. Co. (Fr. pat. 744795, April 26, 1933) prepares a dry size by mixing caustic soda, water and powdered rosin, while preventing any appreciable reaction and maintaining the mixture at ordinary temperature. The proportions of materials are such as to prevent the formation of a fluid size.

A. Allina (Fr. pat. 766919, July 6, 1934) claims that a solid, nonsaponified sizing resin, soluble in water, can be obtained by emulsifying molten colophony in water and introducing a protective colloid, such as casein, and ammonia or an ammonium salt.

According to M. Engelmann (U. S. pat. 2052170, Aug. 25, 1936) natural resin containing abietic acid is ground with dry alkali, such as caustic soda, soda ash or sodium silicate, or mixtures of substances which produce alkali on contact with water (calcium hydroxide and soda ash, or barium hydroxide and sodium sulphate).

Two patents to J. F. Fredriksson (U. S. 2050996, Aug. 11, 1936) and to T. W. Asbury, R. A. Asbury and J. F. Fredriksson (U. S. 2050997, Aug. 11, 1936) relate to the production of dry size by grinding chilled rosin at a low temperature and mixing with a cold, concentrated solution of caustic soda in such a way as to keep the temperature at 65 Fahr. or below.

W. H. Harding and A. W. Montgomery (U. S. pat. 2027166, Jan. 7, 1936) subject a mixture, or solution, of rosin and alkali relatively suddenly to a temperature of 200-500 Fahr. (preferably 280 deg.) so that the mixture is carried rapidly through and beyond the gelling and foaming stages. This is conveniently done by feeding the materials to form a pool between two horizontal, heated, rotating rolls, from which the film of dry size is scraped.

W. H. Harding (U.S. pat. 2128482, Aug. 30, 1938) proposes an improvement on Fredriksson's process. Rosin and caustic soda are ground separately to pass an 80-mesh screen; if desired the rosin may be cooled to 60 Fahr. during grinding. A mixture of 100 parts rosin and 2 parts caustic soda is then sprayed with a solution of 12 parts caustic soda and 12 of water at 80 Fahr., means being taken to prevent any substantial rise in temperature.

According to A. C. Dreshfield and H. A. Johnstone (U. S. pat. 2134911, and 2134912, Nov. 1, 1938) rosin and saponifying materials are heated in a closed reaction chamber to 275-375 Fahr. at a pressure of 100-125 lb. and then discharged by the pressure into a flash chamber maintained at a lower temperature and at a relative humidity of not over 78 per cent. Dry size so made has not over 5 per cent of moisture.

Waxes and Miscellaneous

F. Arledter (Ger. pat. 528312, March 22, 1928) describes a sizing and filling material consisting of a stearine-borax emulsion mixed with sodium stannate and sodium albuminate. As an example, 100 parts of stearine are melted with 100 borax and a little water until a uniform emulsion is formed. To this is added with stirring, and at a temperature below 60 C., 100 parts of casein dissolved with the aid of 20 parts of caustic soda and to which 50 parts of sodium stannate have been added.

G. J. Manson (Brit. pat. 363372, June 6, 1930) describes a sizing material for paper containing particles of waterproofing materials—paraffin wax, mineral oil, pitch, etc.—which have been encysted by a precipitate formed; for example, by the reaction between a sodium silicate solution and a material such as alum, hydrated lime, hydrochloric acid, or zeolitic substances which form insoluble hydrated silicates. A protective colloid, such as glue or casein, may be included.

According to Becker & Co. (Belgian pat. 370401, June 30, 1930) waxes, resins, fats, etc., are stirred in an aqueous dispersing medium in the presence of a protective colloid, such as alkaline casein, at a temperature near the melting or softening point of the substance to be dispersed.

G. T. Lane (U. S. pat. 1840399, June 12, 1932) employs as a sizing agent a soap of a fatty acid containing 9 or more carbon atoms and purified to such an extent that its iodine number is less than 40. This is precipitated in the stock by alum.

R. M. Cobb, D. S. Chamberlain and B. A. Dombrow (*Paper Trade J.*, Sept. 7, 1933) describe the preparation of a wax size emulsion by the use of a specific emulsifying agent whose nature is not disclosed. The emulsions have extremely fine particle size and stability in hard water, and over a wide *p*H range.

F. Schacht G. m. b. H. (Ger. pat. 574411, April 12, 1933) prepares a montan wax size by saponifying with caustic soda. Train oil soap and a little colloidal silicic acid are added to the saponified wax, and the size is used in the beater as usual.

O. F. Neitzke (*Paper Trade J.*, April 25, 1935) describes the apparatus and method of operation in size making by the Bennett process. Melted

rosin, wax and hot caustic soda solution are delivered in measured amounts to a dispersion machine in which the mixture is subjected to violent shearing and impact action. In 6 to 9 seconds the saponification is completed, the wax dispersed and the temperature lowered below the melting point of the wax.

T. Hans and C. E. Raney (U. S. pat. 2015796, Oct. 1, 1935) prepare a waterproofing composition for sizing paper by stirring 300 parts of comminuted cumar resin having a melting point of about 110-115 C. into a mixture of 285-290 parts of water containing 12-16 parts of sodium silicate and 9-10 parts of oleic acid at a temperature of about 32-70 C.

A. F. Burgess (Brit. pat. 480097, June 12, 1936) emulsifies an alkaline solution of an acidic protein such as soy bean protein, with molten paraffin whose melting point is below 78 C. A ratio mentioned is 1 part protein to 2-4 parts paraffin. The emulsion may be used as a beater size or to impregnate paper, which should contain an excess of alum.

W. Brecht and H. Hilz (*Wochenbl.-Papierfabr.*, Feb. 1, 8, 1936) state that rosin melts at 110-120 C. and montan wax at 80 deg. They give methods for preparing test sheets with these sizing agents, and data on their relative sizing efficiency.

A montan wax size is prepared, according to G. J. Manson (U. S. pat. 2030385, Feb. 11, 1936) by adding the molten wax to a solution of a water soluble salt such as magnesium sulphate, and then adding a second soluble salt, such as sodium silicate, adapted to form a gel with the first salt, and produce an emulsion without substantial tackiness.

J. A. Kenney holds two patents (U. S. 2051409 and 2051410, Aug. 18, 1936) for preparing dispersions of nonsaponifiable resins. In the first, coumarone indene resin of a melting point below 40 C. is melted and mixed by violent agitation with 2 parts of sodium silicate until a relatively stable emulsion is obtained. In the second a high melting point resin (127-142 C.) is ground so that 90 per cent will pass a 200-mesh screen, and mixed with sodium silicate until a stable emulsion is obtained.

D. M. McQueen and W. J. Merrill (U. S. pat. 2047217, July 14, 1936) propose as a size, an emulsion containing an aqueous solution of a salt of deacetylated chitin, a water repellent material such as paraffin, which is rendered liquid by heating under the conditions of emulsification, a fixing agent such as aluminum acetate, and an acid resistant wetting agent.

E. E. Mayer (Brit. pat. 466510, May 31, 1937) prepares a sizing agent by heating paraffin wax with an emulsifying wax and a preformed 10 per cent rosin soap solution, the total water during emulsification being 20-50 per cent of the weight of the mixture. Colloid mills or high speed agitators are said not to be necessary in this process.

An anonymous writer (*Wochbl. Papierfabr.*, Sept. 2, 1933) states that the use of montan wax instead of rosin gives higher wet strength, more waterproofness, a softer sheet of closer and smoother surface, and a better finish on calendering.

H. L. Becher (U. S. pat. 1973692, Sept. 18, 1934) melts paraffin and montan waxes and adds with continuous stirring an alkaline solution—caustic soda—in amount sufficient to react with all the saponifiable portions of the mixture.

H. Sinclair (*Paper Trade J.*, Dec. 27, 1934), without attempting to establish specifications, discusses the points which should be taken into consideration in purchasing and using various types of size. No technical data are included.

O. F. Neitzke (U. S. pat. 2093337, Sept. 14, 1937) prepares a size from the non-volatile residue from the purification of tallöl by distillation which he emusifies with an aqueous alkali solution. The same author (U. S. pat. 2096129, Oct. 19, 1937) employs an aqueous hydrocarbon wax-rosin dispersion, stabilized by the addition of inert or nonprecipitable compounds, such as neutral salts of sulphonic acids, or water soluble gums of the nature of gum arabic.

An anonymous writer (*Papier Ztg.* 63 No. 41, 830, 1938) states that for durable sizes and impregnations with montan wax soaps a certain amount (30-50 per cent) of unsaponified wax is necessary. The grams of caustic soda required to completely saponify the wax is given by the formula

Saponification No. of wax x grams of wax

1.4

M. Higaki [*Cell. Ind.* (Tokyo) 9, 275, 1938] examined the sizing value of soy bean oil, tallow, lard, sodium aluminate, etc., and concluded that soy bean oil could be used for papers of ordinary quality if they were dried at somewhat higher temperatures than normal.

N. D. Pankovets and N. A. Leskovich (*Bum. Prom.* 16, No. 3, 13-19, 1938) state that a saving of 40-50 per cent of rosin, and a considerable decrease in deformation of papers can be effected by sizing with alkaline paraffin-rosin emulsion instead of ordinary white size. The mechanical properties of the paper are improved by the use of 2.5 per cent of animal glue. The size is not suitable for hard, stiff, rattly papers, but can be used in litho and offset papers.

L. K. Arnold and J. B. McLeod (PAPER IND. & PAPER WORLD 25, 156, 1943) developed a neutral size for use in cornstalk insulating board in which soda ash is used as a fireproofing agent. They used a paraffin emulsion prepared by the aid of triethanolamine and stearic acid, and precipitated on the fiber by adding 12 per cent of calcium chloride on the weight of the wax. Good sizing requires the use of about 6 per cent of wax.

The Technical Advisory Committee (Paper Makers' Association of Great Britain and Ireland, Tech. Sec., Tech. Bull. 20, 1-3, 1943) reports on the use of Rosmors as partial replacements for rosin. Rosmors of different grades are obtained in the solvent refining of distillates from petroleum. They are highly aromatic in character and free from acidic bodies. Rosmors are added during the size making process to replace up to 25 per cent of the rosin. A possible disadvantage appears to be a somewhat inferior color.

According to I. G. Farbenindustrie, A.G. (Fr. pat. 824592), engine sizing with rosin or wax is improved by adding to the furnish water, soluble polymerized acid amides, such as the polymerization products of acrylic acid or its homologues.

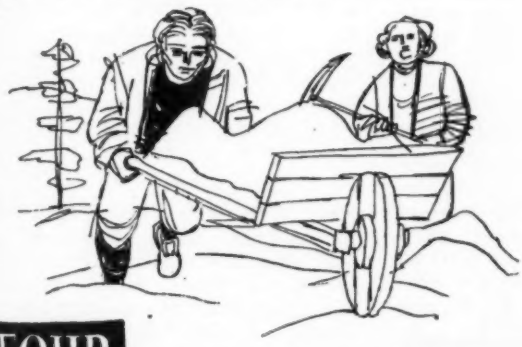
Siebenhirtner Chem. Industrie-Werk G.m.b.H. (Czech. pat.38412) adds to the paper stock a size made by adding saponified stearine to a salt of a heavy metal, especially zinc. Proportions mentioned are 15 stearine saponified with 20-25 per cent of caustic soda, added to 100 of zinc sulphate.

Mr. Sutermeister's article will be continued in an early issue of this magazine.

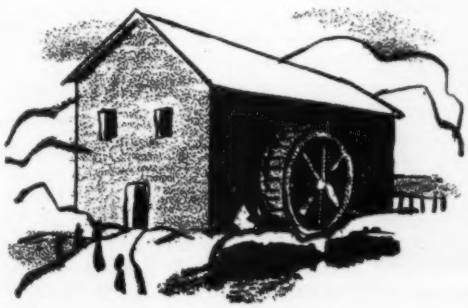
Paper SKETCHES . . . . . .

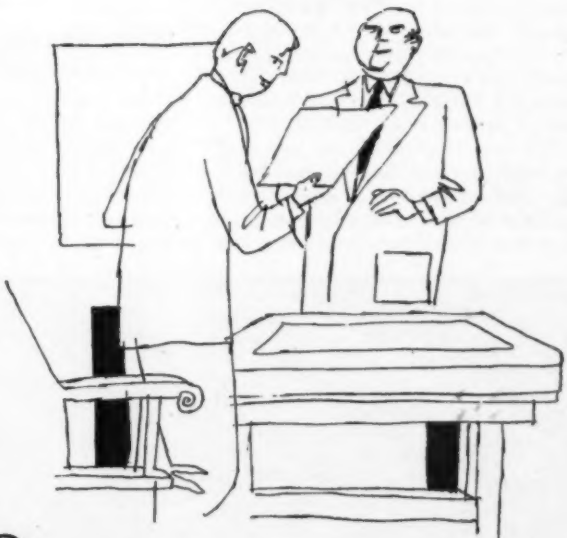
THE CUSTOM OF INTERRING PAPER MONEY WITH THE DEAD WAS BEING PRACTICED IN CHINA AS EARLY AS THE SECOND CENTURY A.D.

DAVID AND JOHN AMES, MASSACHUSETTS PAPERMAKERS OF THE EARLY 1800'S, USED GYPSUM FROM A MINE NEAR SPRINGFIELD AS A LOADING FOR PAPER.

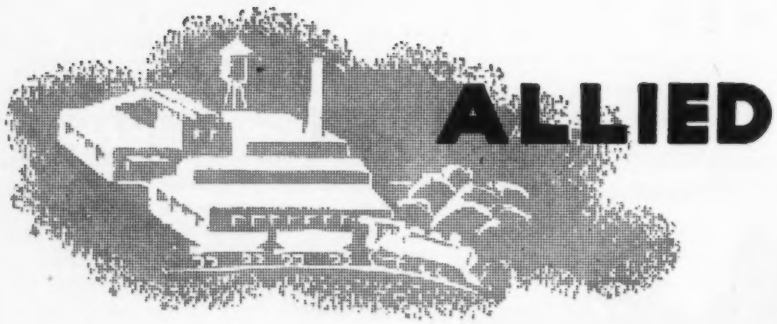


FOUR WORKMEN OPERATED THE RITTENHOUSE MILL IN THE 1690'S.





DURING WORLD WAR II, 20,681,000 POUNDS OF SAFETY PAPER WAS MANUFACTURED FOR THE RATION PROGRAM OF THE U.S. GOVERNMENT.



BUSINESS OF VAN CLEEF BROS. IS TAKEN OVER BY JOHNS-MANVILLE CORP.

The purchase of Van Cleef Bros., Inc., of Chicago, internationally known manufacturers of "Dutch Brand" industrial and automotive products, has been announced by the Johns-Manville Corporation and will be operated as a wholly-owned subsidiary.

The products of Van Cleef Bros., Inc., consist mainly of those involving the use of crude and synthetic rubber, going from liquid cements to molded parts, sponge rubber and coated materials, including a large variety of commercial and industrial tapes.

◆

AMERICAN BRAKE SHOE CO. OPENS NEW FOUNDRIES IN OHIO AND PENNSYLVANIA

Two nonferrous foundries at Niles, Ohio, and Meadville, Pennsylvania, recently completed for American Brake Shoe Company of New York, were opened December 8 and 9, respectively. They are two of six new plants which the company has constructed under its $15,000,000 plant modernization and expansion program.

The new Meadville plant, replacing an older plant of the National Bearing Division of the company, will produce bronze bearings and castings. It will specialize in copper, brass and bronze for railroads, steel mills, and many other industries, and in precision machine bearings for diesel engines and other high-speed and heavy duty service.

The new foundry at Niles, Ohio, which will manufacture railroad journal bearings, is strategically located in the heart of a three-state railway area which includes many car manufacturing plants.

◆

▶▶▶ PRINTS OF A NEW 16-MM. Allis-Chalmers sound movie in color, entitled "The Hi-Density Feeder," are now available from the company's advertising department for showing before interested groups. The 10-minute film explains the unit's construction and operation and shows it in action in various pulp and paper mills, where it handles pulps as high as 8 per cent bone dry consistency without air binding. For clarity in demonstrating actual operating features of the feeder, animated sequences are used.

◆

FOUR WEEK SALES TRAINING FOR SIGNODE SALESMEN

An intensive sales training course was inaugurated in 1946 by the Signode Steel Strapping Company of Chicago. Since then, over 100 salesmen have been trained in applying Signode's Six Point System of Planned Protection to packaging and shipping problems in more than 700 industries.

The training course extends over four weeks. During that period, up-to-date packaging techniques are taught, as well as newest methods of materials handling, correct application of steel strapping to all types of shipping packs, to securing leads in carriers, and the principles of good shipping container construction.

Group from a Signode sales training class in full-size model of box car receiving instructions on the application of the new Signode wall cleat method of bulkbinding

Under the direction of qualified instructors, Signode salesmen are taught to use the strapping and tools they sell, and personally apply strapping to a wide variety of shipping containers, and to loads in box cars. Also salesmen are taught methods of applying steel strapping to cut man-hours in shipping rooms, in materials handling, in warehousing, and on loading docks and in carriers.

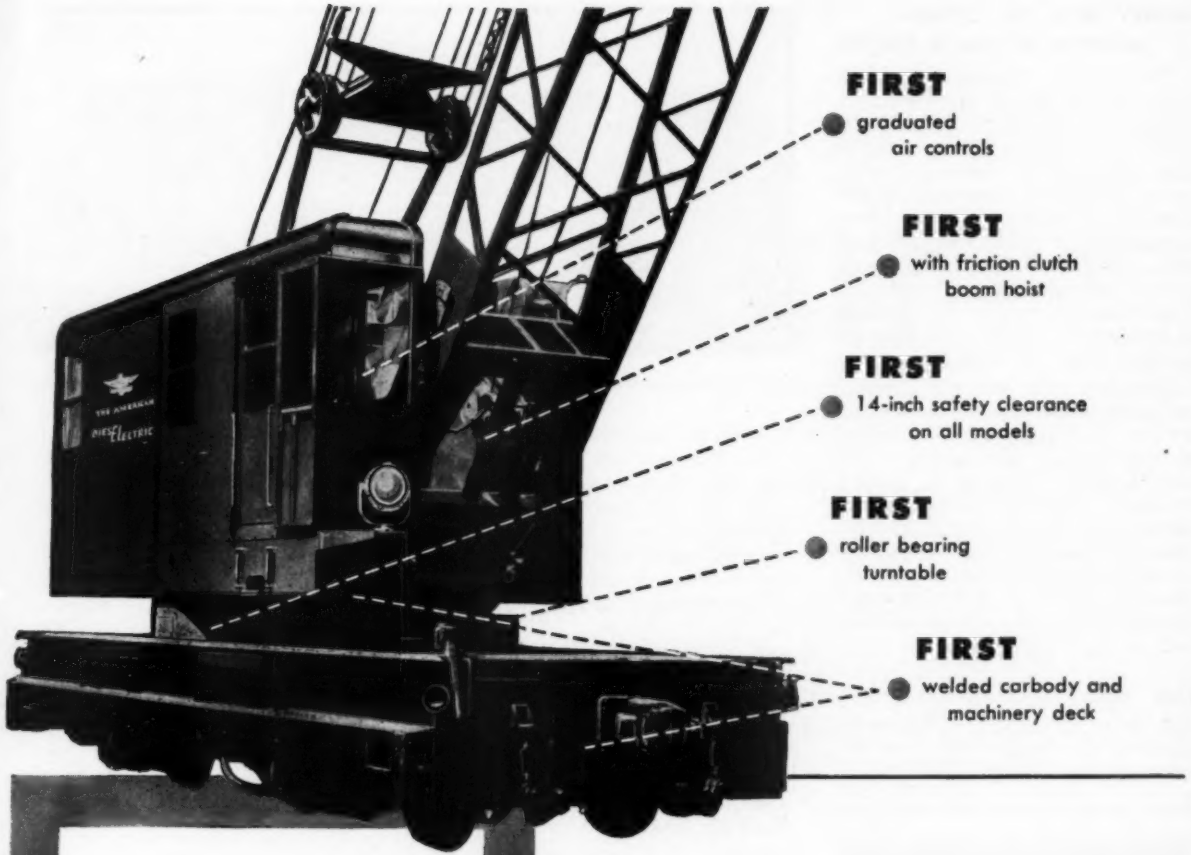
◆

▶▶▶ THE WESTERN DIVISION of Monsanto Chemical Company has announced plans to install a small plant at Decatur, Illinois, moving to that city a portion of the company's Portsmouth, Virginia, operation which manufactures glues and adhesives. H. P. Banks, vice president of Monsanto and general manager of the Western Division, said that it is impossible to state when operations at the new plant will begin, but it certainly will not be before July 1, 1948.

◆

▶▶▶ CONSTRUCTION WILL soon start on an oxygen filling station and acetylene producing plant at Little Rock, Arkansas, by The Linde Air Products Company, Unit of Union Carbide and Carbon Corporation. The plans also include a warehouse for the distribution of Union Carbide.

New Meadville (Pa.) plant of National Bearing Div., American Brake Shoe Co.



THE American
DIESELECTRIC
Locomotive
Crane
Continues an Impressive List of...
"FIRSTS"!

DIESEL-ELECTRIC LOCOMOTIVE CRANE, PATENT NO. 2083480. TOUCH CONTROL, PATENT NO. 2370656.

Here is the remarkable new locomotive crane that writes off its own cost in five years. The crane with "DIESEL power to the deck; ELECTRIC power to the trucks." It's the biggest locomotive crane news in years.

For the background of this news, let's look at the record. Named above are five of the most important all-time developments in locomotive crane design. *All five* are American Hoist "firsts"! In addition, more than a dozen other major improvements (travel throw-out clutch, enclosed travel gears, etc.) could be added to the list. Nearly all of these advancements have been adapted or copied widely.

The DIESELECTRIC is, indeed, revolutionary. More than *seven tons* of wearing parts have been eliminated. Maintenance expense has been cut 25% to 50%. Every part of the crane is new—designed specifically and solely for the DIESELECTRIC. The past record of all "American" Locomotive Cranes, and the long years of testing and development that went into the DIESELECTRIC assure it a brilliant future.

Write today for New Catalog 600-L-4.

Sales Offices:
New York
Pittsburgh
Chicago
New Orleans
San Francisco

PLANT No. 2—SO. KEARNY, NEW JERSEY

American Hoist
and DERRICK COMPANY
St. Paul 1, Minnesota

780

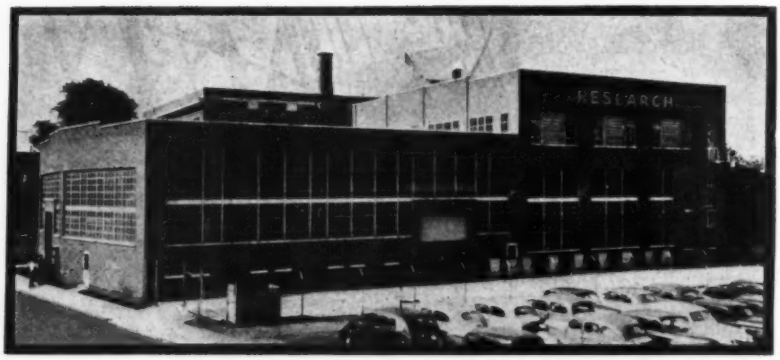
JEFFREY MFG. CO. OPENS MODERN RESEARCH CENTER

The recently completed Research Center of the Jeffrey Manufacturing Company, Columbus, Ohio, is described in a brochure now available from the company. Modern in every respect, the center is equipped to perform tests of sufficient scope to insure accurate predetermination of field results, also the construction of experimental and pilot plant equipment. Experienced testing and development technicians and engineers supervise the performance of all laboratory work.

Identified with this new research and development program are the following: A. W. Lemmon as manager of research and development, Chain and Materials Handling Division; J. A. Flint as manager of research and development, Crusher and Traylor Division; Sterling C. Moon as manager of research and development, Mining Division; and L. E. Newell as superintendent of research manufacturing and testing.

◆

▶▶▶ NEW OFFICES and a large addition to the existing warehouse facilities in Cleveland, Ohio, have been completed by Joseph T. Ryerson & Son, Inc., distributors of steel from stock. The new unit is a brick and concrete structure over a steel framework, and will provide 80,000 additional square feet of heated warehouse space and approximately 13,000 square feet of space in which is housed the company's new offices.



View of recently-completed Research Center of The Jeffrey Manufacturing Company

◆

▶▶▶ A LONG-TERM LEASE of ilmenite-bearing lands has been signed with the state of Florida by the Du Pont Company. This will provide a large domestic supply of the ore and will end the company's dependence upon foreign sources. Ilmenite is the black ore from which white titanium pigments are manufactured by Du Pont at its plants in Baltimore, Md., and Edge Moor, Delaware.

◆

▶▶▶ A NEW BEARING FIRM, called Dale Bearings, Inc., has been organized in New York recently announced by Clayton A. Decker, president. Offices have been opened at 1974 Broadway to distribute the antifriction bearing products of several nationally known manufacturers.

◆

▶▶▶ RECENTLY COMPLETED and now in operation is the first production unit of the new Willow Island, West Virginia, plant of the Calco Chemical Division, American Cyanamid Company. A second large unit is scheduled for operation in January 1948. All construction work and installation of equipment for the current plant construction program is expected to be completed within a few weeks.

◆

▶▶▶ MERGER OF Laucks, Ltd. (Vancouver, B. C.), into Monsanto (Canada) Ltd., which had been under way for over a year, was completed December 31. Early in 1946 Monsanto had acquired the capital stock of Laucks, operating the company as a wholly-owned subsidiary. Operations in Vancouver will be in the charge of Branch Manager J. G. MacDermot.

◆

▶▶▶ AN ACETYLENE PLANT and an oxygen filling station are being constructed at Creve Coeur, a suburb of Peoria, Illinois, by The Linde Air Products Company, unit of Union Carbide and Carbon Corporation, New York City. The plans also include a warehouse for the distribution of Union carbide. The plant will be served by a spur track of the Nickel Plate Railroad.

◆

▶▶▶ PRODUCTION has been resumed by the Hewitt Rubber Division, Hewitt-Robins, Inc. (Buffalo, N. Y.), of its top brand Maltese Cross fire and chemical hose after being withheld from manufacture during the war.

The new Willow Island (W. Va.) plant of the Calco Chemical Division, American Cyanamid Company. The first production unit has been completed and put into operation

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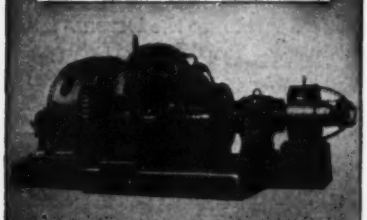
A Complete Service in Either Rebuilt or New

REBUILDERS OF . . . A.C. and D.C. Motors, Generators, M-G Sets, Pumps, Control Equipment, Transformers, Switchboards, Alternators.

DISTRIBUTORS OF . . . Rockwood Drives and Bases, Falk Couplings, Modern Motor Drives, General Electric Motors and Control.



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For dependable, high-speed roll-winding machines of any capacity—for top performance on any type of paper or paperboard—to meet any mill or converting plant requirement—*the name to know is* CAMACHINE.

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CAMACHINE 20

For newsprint book and kraft. Web widths 180" to 310". Speeds up to 4000 fpm.

ASSOCIATIONS

HARRY E. WESTON APPOINTED ASSOCIATE SEC'Y - TREAS. OF SUPERINTENDENTS ASS'N

A release from the office of Raymond F. Bennett, president of the American Pulp and Paper Mill Superintendents Association, announces the appointment of Harry E. Weston as associate secretary-treasurer of the Association. Mr. Weston will be located at 38 South Dearborn Street, Chicago, and will assume his duties on February 16.

Mr. Weston entered the pulp and paper field prior to World War I in production work. He is a graduate of the New York State College of Forestry at Syracuse, New York, and taught pulp and paper making courses there from 1920 to 1926. Following his teaching experience, Mr. Weston entered the field of sales engineering, confining his efforts to selling machinery to pulp and paper mill organizations throughout the Middle West and East.

In 1927, Mr. Weston became associated with Edward B. Fritz, Chicago, Illinois, as advertising manager of THE PAPER INDUSTRY. He continued in this capacity until August, 1932, when he was made editor, and subsequently, through the combining of two magazines, editorial director of THE PAPER INDUSTRY AND PAPER WORLD. It is from this latter position that he comes to the Superintendents Association.

Mr. Weston is the author of two books: *Lectures on Pulp and Paper Mill Machinery* and a nontechnical treatise entitled *A Book on Paper*. In addition, he has written many articles on subjects relating to the manufacture of pulp and paper for the business press of the industry.

Mr. Weston is a member of both the American Pulp and Paper Mill Superintendents Association and TAPPI. He was one of the founders of the Chicago Professional Paper Group, and served as its president for two years—1944-1945, and 1945-1946.

In his new appointment, Mr. Weston will work with both members and affiliates in promoting project work and other activities for their benefit and the benefit of the pulp and paper industry. He will work closely with George Craigie, secretary-treasurer, and the main office of the Association in New York.

Harry E. Weston

◆

WESTERN NEW YORK TAPPI HOLDS PANEL DISCUSSION AT JOINT MONTHLY MEET

The regular monthly meeting of the Western New York Group, Empire State section, Technical Association of the Pulp and Paper Industry, was held as a joint meeting with the Canadian Pulp and Paper Association, Technical Section, Niagara Branch, recently at the Prospect House, Niagara Falls, N. Y. A panel discussion on "Pulp Stock Preparation" was the topic of the evening.

W. H. Monsson, Chairman of the Program Committee, introduced the panel, consisting of R. F. Vokes, director of laboratory, Dilts Machine Works, Fulton, N. Y.; C. H. Vickery, manager of sales, E. D. Jones Co., Pittsfield, Massachusetts; and D. G. Sutherland, vice president, Sutherland Refiner Corporation, Trenton, N. J. After each member of the panel had spoken briefly on the methods and equipment used in stock preparation, the meeting was opened for discussion.

During the open discussion, many questions were addressed to and answered by the members of the panel. The definitions of many terms used in paper making were discussed.

The meeting was attended by approximately 100 technical men from local and near-by industries, presided over by Dr. A. H. Nadelman, International Paper Co., Niagara Falls, New York.

◆

▶▶▶ PRESENTATION of the National Merchandising Program of the Waxed Paper Industry was made in Chicago recently to sales managers, promotion managers, and advertising managers of waxed paper manufacturers. The primary purposes of the meeting were to acquaint the advertising and sales personnel of each company with the various objectives of the merchandising committee's activities, and to present them with materials and ideas with which to carry out these objectives within their own companies.

◆

ENGINEERING FEDERATION OF MINN. TO HOLD ANNUAL EXPOSITION IN ST. PAUL

The fifteen member societies of the Minnesota Federation of Engineering Societies will stage their twenty-sixth annual engineering convention and third annual engineering exposition February 11 to 14 in St. Paul, Minnesota.

Luncheons, business sessions, symposiums, technical discussions, dinners and talks by state and national figures have been booked for the convention in Hotel Lowry, while exhibitors already are preparing hundreds of the latest properly engineered products and devices for exhibition in the municipal auditorium. The exposition, open to the public, is expected to draw 100,000 spectators.

◆

CHICAGO TECH. EXPERTS TO MEET IN CONFERENCE

"A Progress Report to the Nation" will be the theme of the Chicago Technical Conference slated for March 22-24, 1948 at the Stevens Hotel. A registration of 10,000 men is anticipated. Unique in the history of such conferences will be the emphasis on nontechnical, everyday language so that the layman may understand the discoveries, new processes, new techniques, and new materials that are molding the future of mankind.

Held in conjunction with the annual Chicago Production Show, the conference will be sponsored by the 51 scientific, engineering, and tech-

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No single type of dryer felt will meet the needs of all mills. But HOOPERWOOD "Canvas Engineering" has the answer to that problem—a specific HOOPERWOOD Dryer Felt for each requirement.

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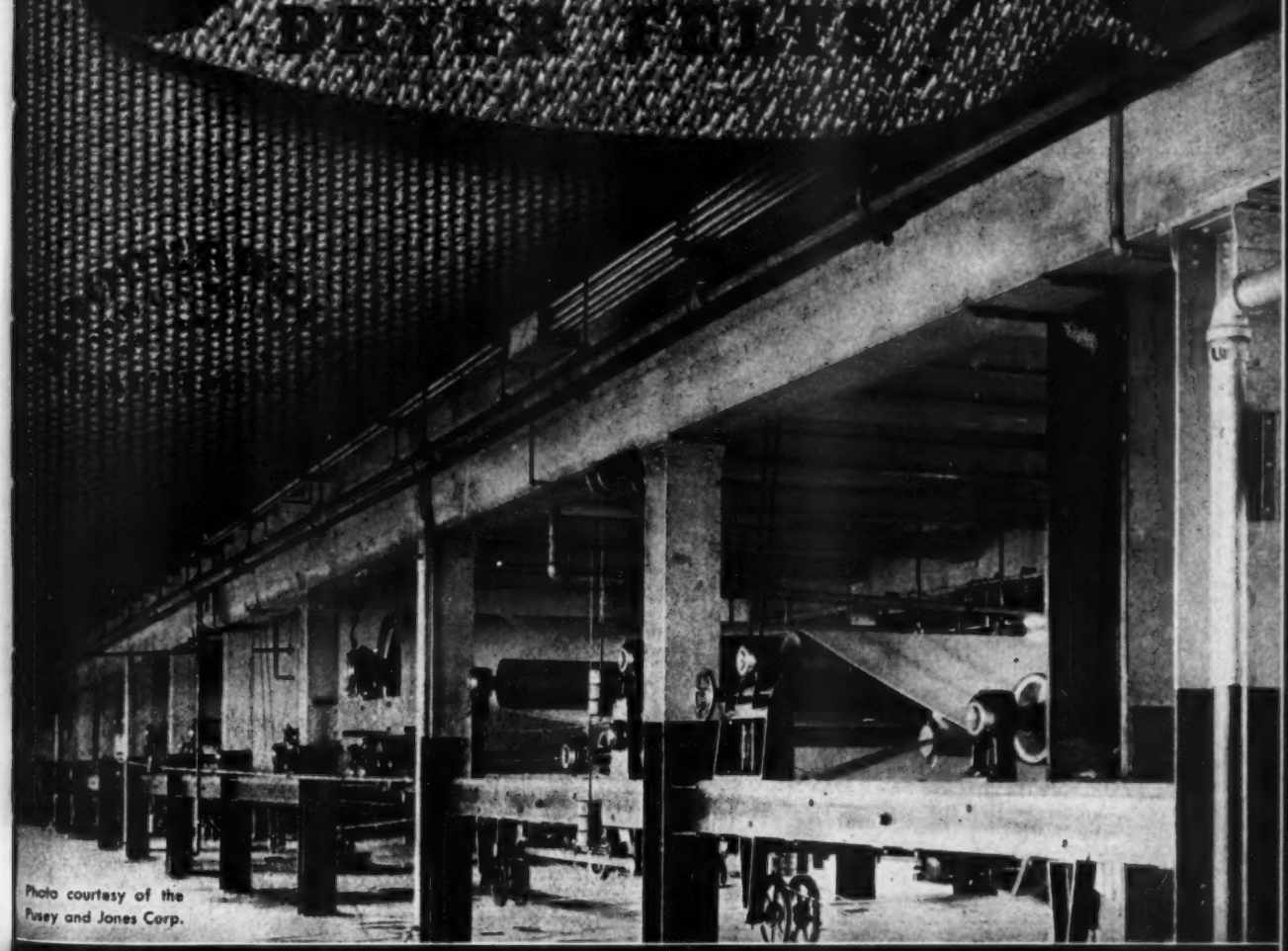

Photo courtesy of the Pusey and Jones Corp.

HOOPERWOOD DRYER FELTS

COTTON AND ASBESTOS

nological societies affiliated with the Chicago Technical Societies Council.

Open to the general public, the conference sessions will cover modern advances in the leading industries. Among the participating societies is the Chicago Professional Paper Group.

Suppliers to industry desiring information about booth space are invited to write or wire Paul A. Jenkins, Executive Secretary, Chicago Technical Societies Council, 53 W. Jackson Blvd., Chicago 4, Illinois.

◆

FALL MEETING OF PACIFIC COAST DIVISION SUPTS. ASS'N HELD AT SEATTLE

The fall convention of the Pacific Coast Division of the American Pulp and Paper Mill Superintendents Association was held recently in Seattle, Washington. Re-elected officers are Gerald F. Alcorn as chairman, associated with the Weyerhaeuser Timber Co., Pulp Division, Everett, Washington; and Fred R. Armbruster as secretary-treasurer, with The Dow Chemical Company, Great Western Division, Seattle, Washington. Newly elected officers include H. Radford Russell, Everett Pulp and Paper Co., Everett, Washington, as first vice president and L. D. McGlothlin, Crown Zellerbach, Camas, Washington, second vice president.

Present at the meeting and special guest at the banquet and men's luncheon was Raymond F. Bennett, of Ecusta Paper Corporation and national president of the association. William W. Clarke, of the Longview Fibre Co., Longview, Washington, acted as moderator for the main session of papermaking representatives. Prominent on the technical program was George A. Richter of the Eastman Kodak Company who discussed the relation of pulp making and the plastics industry.

◆

▶▶▶ THE ANNUAL MEETING of The Association of American Wood Pulp Importers was held recently, and the following officers were elected: President, James Donaldson; vice president, S. G. Blankinship; secretary, George N. Dutcher; director, Rolf G. Westad; and the re-elected treasurer is V. Ramsay.

◆

▶▶▶ THE EIGHTH ANNUAL International Heating and Ventilating Exposition will be held in Grand Central Palace, New York, February 2 to 6, 1948. The exposition sponsor, the American Society of Heating and Ventilating Engineers, is holding its annual meeting coincident with the exposition. Every requirement in the heating, ventilating and air conditioning of institutions, industrial plants and homes will be represented in the list of exhibits, now numbering nearly three hundred.

◆

▶▶▶ THE FOURTH ANNUAL conference and exhibition of the National Association of Corrosion Engineers will be held April 5-8, 1948, at the Jefferson Hotel, St. Louis, Missouri. The exhibition with displays by various manufacturers will show the latest in equipment, material and methods for combating corrosion.

◆

FOREST PRODS. RESEARCH SOCIETY HOLDS ITS FIRST NATIONAL MEET IN CHICAGO

Four hundred and seventy-eight members and guests interested in forest products utilization and production attended the first national meeting of the Forest Products Research Society held recently at the American Furniture Mart in Chicago.

Founded less than a year ago, the Society has grown to 955 members and includes individuals located in the United States, Canada and twelve foreign countries. The board of directors announced that plans already are under way for the second national meeting scheduled for Chicago, March 22, 23, and 24.

Displays portraying recent developments in equipment and processes were shown by 40 manufacturers and research laboratories in an exhibit hall adjoining the meeting room.

◆

COMING EVENTS

Feb. 2-6—Eighth International Heating and Ventilating Exposition, Grand Central Palace, New York City.

Feb. 15-19—First 1948 regional meeting of the American Institute of Chemical Engineers, Roosevelt Hotel, New Orleans.

Feb. 23-26—Annual meeting of the American Paper and Pulp Association and paper groups, at the Waldorf-Astoria Hotel, New York City.

Feb. 23-26—Annual meeting of the Technical Association of the Pulp and Paper Industry, at the Commodore Hotel, New York City.

May 19-21—Annual meeting of the American Pulp and Paper Mill Superintendents Association, at the Roosevelt Hotel, New Orleans, La.

Oct. 18-22—Thirty-sixth Annual Safety Congress, Chicago (Details later).

STATED MEETINGS

Chicago Professional Paper Group meets the third Monday of each month at the Chicago Bar Association, Chicago, Illinois (except July and August). The March meeting has been changed from the regular date of March 15 to March 22.

Stebbins was there
The excerpts shown from the Finch, Pruyn & Company article in the June Pulp & Paper Industry are news now, because they tie Stebbins name with a mill's unusual changeover to higher quality papers.
All tile work in the modern screen layout is by Stebbins.
All chests and vats are Stebbins tile-lined
the deckers, tiled by Stebbins,
PULP & PAPER INDUSTRY June 1947
For 63 years Stebbins has been allied with pioneering and development work in the pulp and paper industry. It is the thoroughness of Stebbins research and development that accounts for the fact that 80% of all chemical pulp made on this continent at some stage of its manufacture is processed in equipment built or lined by Stebbins.
Consult Stebbins on your next lining or tile tank job.
SEMCO
Stebbins Engineering and Manufacturing Company
EASTERN BOULEVARD, WATERTOWN, NEW YORK

BOARD

GLASSINE

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RAG

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VERSATILITY

THE JONES *High Speed* REFINER

The remarkable versatility of the JONES High Speed Refiner is evidenced by its use in mills everywhere. The fillings are individually designed for successful operation on every type of paper stock from news to rag. Used for general utility purposes, they replace large units handling same volume, and afford many operating advantages and economies.

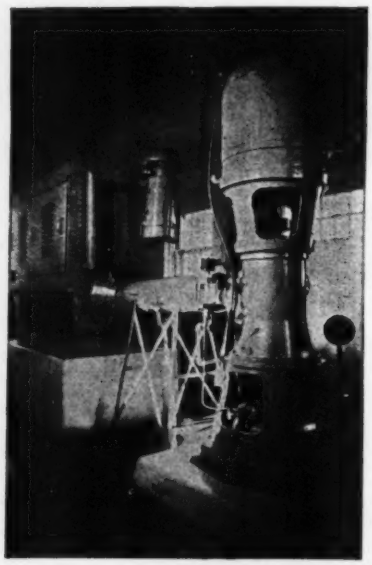
Jones

E. D. JONES & SONS COMPANY-PITTSFIELD, MASS.
Builders of Quality Machinery for Paper Mills

MANUFACTURERS AND DISTRIBUTORS IN CANADA WATEROUS LTD., BRANTFORD, ONT.

IN CASE OF

Power FAILURE



The city of Margate, New Jersey no longer worries about an unforeseen powerline failure. Their newly installed million gallon per day Layne Well Water System is DUAL POWERED. Should the power fail and the electric motor "go dead" a big husky gasoline engine takes over to keep up water production.

Margate's new dual powered water system is a quality installation throughout with the very latest Layne developed control and engineering features. And like two other Layne installations for Margate—one of which is over 23 years old, this new unit will also give years and years of satisfactory operation.

Layne Well Water Systems whether installed for cities, factories, railroads, irrigation projects or other use, keep water production at the very lowest cost. Furthermore Layne associated companies constantly provide prompt repair and parts service for their Layne installation. For late catalogs, address Layne & Bowler, Inc., General Offices, Memphis 8, Tennessee.

LAYNE WELL WATER Systems

AFFILIATED COMPANIES: Layne-Arkansas Co., Stuttgart, Ark. * Layne-Atlantic Co., Norfolk, Va. * Layne-Central Co., Memphis, Tenn. * Layne-Northern Co., Mishawaka, Ind. * Layne-Louisiana Co., Lake Charles, La. * Louisiana Well Co., Monroe, La. * Layne-New York Co., New York City * Layne-Northwest Co., Milwaukee, Wis. * Layne-Ohio Co., Columbus, Ohio * Layne-Pacific, Inc., Seattle, Wash. * Layne-Texas Co., Houston, Texas * Layne-Western Co., Kansas City, Mo. * Layne-Minnesota Co., Minneapolis, Minn. * International Water Supply Ltd., London, Ont., Can. * Layne-Hispano Americana, S. A., Mexico, D. F.

GREEN CROSS FOR SAFETY

SAFETY SCORES

▶▶▶ THE ACCIDENT frequency rate for October was 15.24—6 per cent lower than the rate for September. This resulted in the cumulative experience showing a decrease of 13 per cent from the rate for the same period of last year. Forty-four companies have perfect records for the experience reported in the contest to date.

Division I—Pulp and Paper Mills

Group A

(None.)

Group B

Kimberly-Clark Corp. (Badger-Globe Mill), Neenah, Wis.

Marinette Paper Co., Marinette, Wis.

Crown Zellerbach Corp., Port Townsend, Wash.

St. Croix Paper Co., Woodland, Me.

Group C

National Gypsum Co. (Mobile Plant), Mobile, Ala.

The Mead Corp. (Sylva Div.), Sylva, N. C.

The Crystal Tissue Co., Middletown, Ohio.

Certain-teed Products Corp., York, Pa.

Container Corp. of America, Wabash, Ind.

Riverside Paper Corp., Appleton, Wis.

Group D

Armstrong Cork Co., Pensacola, Fla.

United States Gypsum Co., Lisbon Falls, Me.

Hollingsworth & Whitney Co. (Abenaquis Mill), Madison, Me.

Hollingsworth & Vose Co., West Groton, Mass.

Certain-teed Products Corp., Dallas, Texas.

Container Corp. of America, Carthage, Ind.

Container Corp. of America, Circleville, Ohio.

Fort Wayne Corrugated Paper Co., Vincennes, Ind.

Riegel Paper Corp. (Hughesville Plant), Riegelsville, N. J.

United States Gypsum Co., North Kansas City, Mo.

Spaulding Fibre Co., Inc., Milton, N. H.

United States Gypsum Co., Oakmont, Pa.

National Gypsum Co., Garwood, N. J.

National Gypsum Co., Newburgh, N. J.

Certain-teed Products Corp., Buffalo, N. Y.

Container Corp. of America, Los Angeles, Calif.

Kimberly-Clark Corp., Kapuskasing, Ont., Can.

Container Corp. of America, Wilmington, Del.

Container Corp. of America (Western Container), Tacoma, Wash.

Division II—Paper & Board Remanufacturing

Group A

(None.)

Group B

Oswego Falls-Sealright Corp. (Cap Div.), Oswego, N. Y.

Canadian Cellucotton Products Co., Ltd., Niagara Falls, Ont., Can.

Container Corp. of America, Fort Worth, Texas.

Old Colony Envelope Co., Westfield, Mass.

Container Corp. of America, Cleveland, Ohio.

A. B. Dick Co. (Lake Street Plant), Chicago, Ill.

Group C

Fort Wayne Corrugated Paper Co., Hartford City, Ind.

Ft. Wayne Corrugated Paper Co. (Rochester Div.), Rochester, N. Y.

Thilmany Pulp & Paper Co. (Bag Mill), Kaukauna, Wis.

Container Corp. of America, Baltimore, Md.

Container Corp. of America (Container Div.), Los Angeles, Calif.

The Flintkote Co. (Hollywood Paper Box Div.), Los Angeles, Calif.

The Hankins Container Co., Chicago, Ill.

Essex Paper Box Mfg. Co., Newark, N. J.

Bay West Paper Co., Green Bay, Wis.

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▶▶▶ THE SECOND ANNUAL labor-management safety conference of the pulp and paper industry in Oregon was held at Salem, Oregon, on December 11 and 12. The conference is the result of a joint program developed by the Pacific Coast Association of Pulp and Paper Manufacturers, and the International Brotherhood of Pulp, Sulphite and Paper Mill Workers. Co-chairmen were John Sherman, vice president of the pulp, sulphite and paper mill workers, and O. R. Hartwig, general safety supervisor of Crown Zellerbach Corporation.

THE SUN NEVER SETS ON THE HYDRAPULPER

You find them East. You find them West. You find them in the North and you find them in the South. Western hemisphere, Eastern hemisphere, North of the Equator and South of it. The widespread adoption of the Hydrapulper attests its efficiency.

Batch or Continuous — Complete range of capacities. Also broke Hydrapulpers for installation under calenders.

For complete technical data, installations in your neighborhood and all other pertinent data, write Shartle or write Dilts.

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NAMES in the News

PERSONALS

"W. B." MILHAM IN FINE SHAPE ON 90TH BIRTHDAY

Three brothers, whose years totaled 255, met December 29 in Kalamazoo, Michigan, to celebrate the 90th birthday of the oldest member of the trio.

The guest of honor on this occasion was William B. Milham, who spent most of his active years in the paper industry. The birthday luncheon marking this anniversary was given at the home of Allan B. Milham, son of William B., who retired from the presidency of Bryant Paper Company in Kalamazoo when it was taken over by St. Regis Paper Company.

William B. Milham began life on a farm in Kalamazoo County, but sixty years ago he became financially interested in the Bardeen Paper Company, Otsego, Michigan. In 1895 Mr. Milham and Noah Bryant founded the Bryant Paper Company in Kalamazoo. Noah Bryant was the first president of the company. In 1932 Mr. Milham became president of the company and served in that office until 1937 when he became chairman of the board.

The two brothers who helped "W. B." celebrate were Loomis R., aged 85, and Oliver A., 80, both of whom still operate farms south of Kalamazoo.

◆

▶▶▶ At a recent directors meeting *C. C. Walker* was elected a commercial vice president of the General Electric Company (Schenectady, N. Y.). Mr. Walker will assume responsibility for customer relations in the New England territory, with headquarters in Boston. He succeeds T. S. Knight, who retired December 31 after 44 years of service with the company.

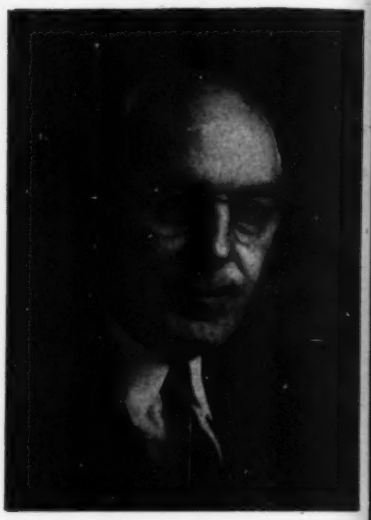
When William B. Milham (second from right) celebrated his 90th birthday recently, his two brothers and three sons were with him for a birthday luncheon at the home of Allan B. Milham (right), one of the sons. Others shown here are (L to R): Oliver Milham, 80, a brother; Irving Milham, a son; Loomis R. Milham, 85, the other brother; and Wayne Milham, the third son

▶▶▶ Liquid Conditioning Corporation (Linden, New Jersey), announces the appointment of *Tom Charbonneau* as Florida representative and *Ramon I. Gil* as representative in Puerto Rico. Mr. Charbonneau has had many years of extensive experience in this work. For the last seven years he has been engaged in sales and supervising work on treatment boiler feedwater and consulting work on waste recovery, municipal water plants, etc. Mr. Gil is a licensed engineer for Puerto Rico, where he has been engaged in engineering work for more than 20 years. Since 1927 he has been located in Puerto Rico.

◆

DOWNINGTOWN MFG. CO. APPOINTS ENGINEERS— SCHRIER AND DE PAN

The appointment of Frank F. Schrier to the engineering staff of Downingtown Manufacturing Company, Downingtown, Pennsylvania, has been announced. Mr. Schrier has had thirty-seven years of experience in the design, manufacture and operation of paper mill machinery. He will be located in the company's main office in Downingtown.



Frank F. Schrier

Also announced by Downingtown is the appointment of R. T. De Pan as development engineer. A graduate of the pulp and paper course of the New York State College of Forestry, Mr. De Pan has had six years experience in development and research

R. T. De Pan

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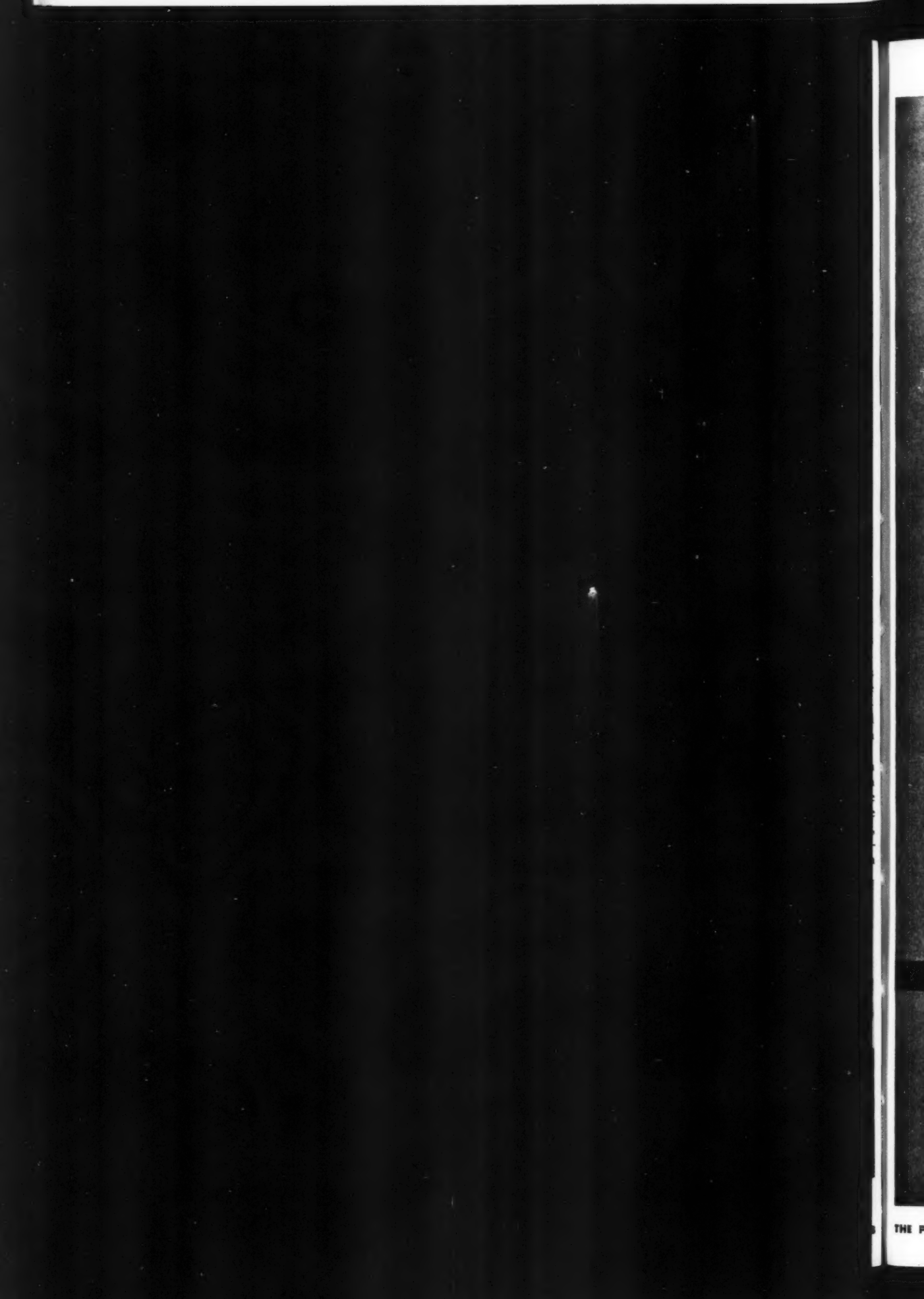

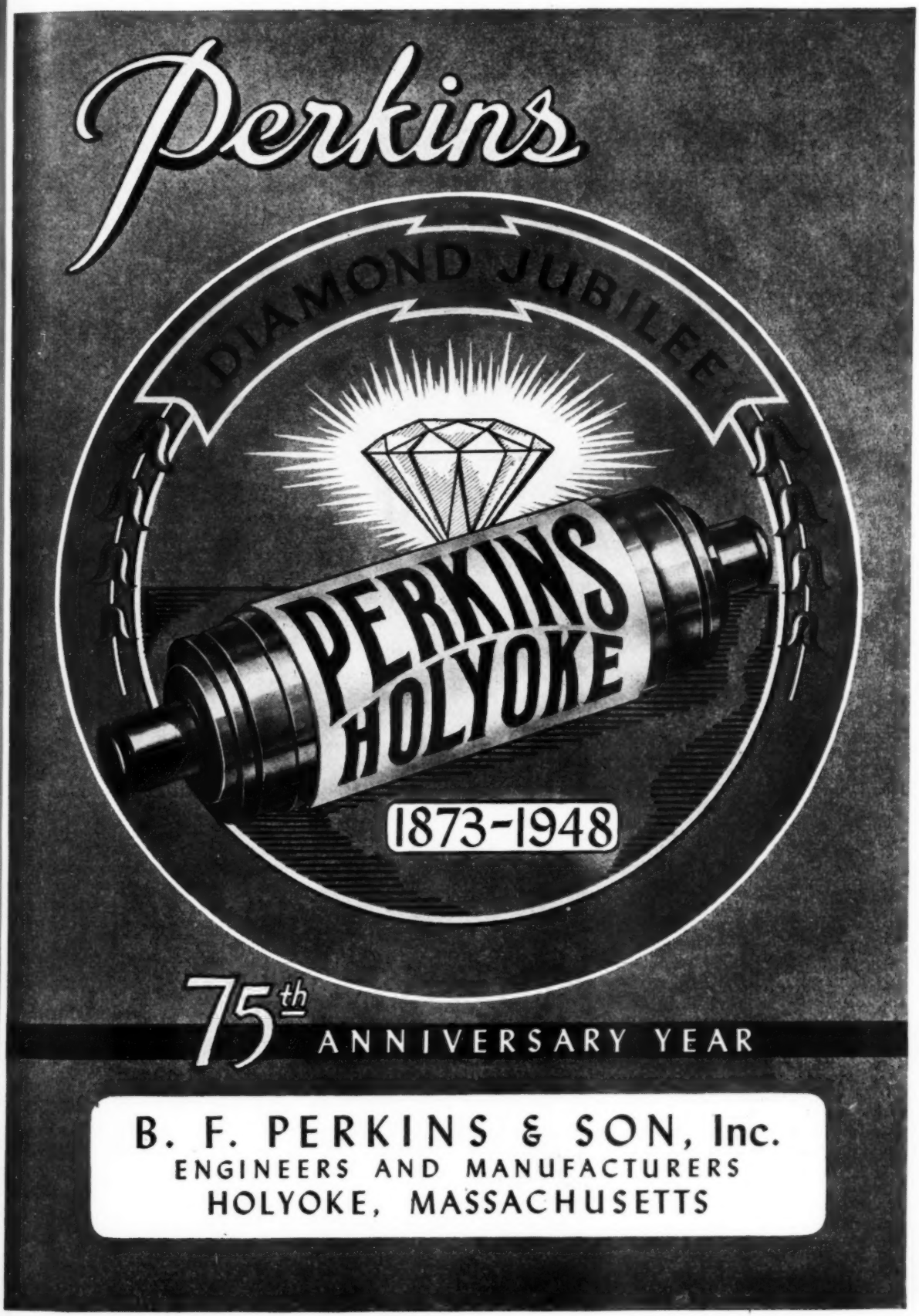
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DIAMOND JUBILEE
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HOLYOKE
1873-1948
75th ANNIVERSARY YEAR
B. F. PERKINS & SON, Inc.
ENGINEERS AND MANUFACTURERS
HOLYOKE, MASSACHUSETTS

work for the Flintkote Company of E. Rutherford, New Jersey, and one year as plant manager of the Mt. Carmel Roofing Felt Mill of the Flintkote Company.

◆

CARL H. KING APPOINTED SUPERVISOR OF EMPLOYEE TRAINING FOR MANDO

The appointment of Carl H. King as supervisor of employee training for the Minnesota and Ontario Paper Company, Minneapolis, was announced December 9 by G. N. Williams, director of industrial relations.

Mr. King will develop conference and training programs at each of the company's three operating mills, International Falls, Minnesota, Fort Frances and Kenora, Ontario. These programs will be developed with the co-operation and assistance of the supervisory staffs of the various mills.

Previous to this appointment, Mr. King was director of vocational education and training for the state of Illinois. During the war years, he developed and administered a program of training involving some 17,000 employees at the Douglas Aircraft Corporation, Chicago.

Mr. King has a masters degree in industrial and vocational education from the Iowa State College, Ames, Iowa.

◆

▶▶▶ Formerly a methods supervisor with The Reliance Electric & Engineering Company, Cleveland, *Clifford C. Tippit* is now manager of the company's newly created Order and Planning Department.

◆

INSTITUTE OF PAPER CHEM. NAMES DR. EMIL HEUSER GROUP LEADER EMERITUS

Having requested to be relieved of his active duties as head of the Cellulose Division of The Institute of Paper Chemistry (Appleton, Wis.), Dr. Emil Heuser was named Group Leader Emeritus and consultant in cellulose chemistry, effective January 1, according to Westbrook Steele, executive director.

In a special ceremony on December 15 which was witnessed by the entire staff and student body of the Institute, President Nathan M. Pusey conferred on Dr. Heuser an honorary degree awarded by Lawrence College with which The Institute of Paper Chemistry is affiliated. In presenting the degree President Pusey said, "We feel that Lawrence College does not so much honor you as that you honor us. Because of your long and distinguished service and the unique place of warmth and friendship that you have made for yourself in our hearts, it is a privilege and a pleasure to take this means of welcoming you permanently into the Lawrence College family."

Carl H. King

Dr. Emil Heuser

Morlan J. Grandbois

Recognized as a leading authority in the field of cellulose chemistry, and particularly in recent years for his definitive text on *The Chemistry of Cellulose*, Dr. Heuser has been head of the cellulose division of The Institute of Paper Chemistry since 1938. Dean Harry F. Lewis spoke of his contributions to the industry and the Institute during his ten years of service. His monumental work on cellulose chemistry, his technical publications, and his many research reports were cited as tangible evidence of his activity.

Born in Stralsund, Germany, in 1882, Emil Heuser attended the Technical University of Munich, University of Graz, and Technical University of Karlsrube where he received the degree of Doctor of Engineering Science in 1909. He was a chemist in the pulp and paper industry in Germany and Austria for a number of years, and in 1912 became the first professor of cellulose chemistry at the Technical University of Darmstadt, where he served over a period of eleven years (1912-1923). During this time he became editor of *Papierfabrikant* (1918 - 1923) and also founded and edited the periodical *Cellulosechemie* until he left Germany. From 1923 to 1926 he headed the research department of a group of rayon manufacturers and also was honorary professor of cellulose chemistry at the Technical University of Berlin, Charlottenburg. In 1926 he came to Canada as director of research of the Canadian International Paper Company, and in 1938 joined the staff of The Institute of Paper Chemistry at Appleton, Wisconsin. His books, *Lebrbuch der Cellulose-Chemie* in Germany (later translated into English by C. J. West and Gustavus J. Esselen, Jr.) and *The Chemistry of Cellulose*, published in 1944, are well known. He is a past chairman of the Division of Cellulose Chemistry of the American Chemical Society.

◆

M. J. GRANDBOIS NAMED TO DIRECT ALL ADVERTISING FOR ST. REGIS PAPER CO.

Morlan J. Grandbois, for four years promotion manager of the Bryant Paper Company, and since the purchase of that company by the St. Regis Paper Company in 1946 in the same position, has been placed in charge of all advertising for the St. Regis Paper Company. His new assignment in-

RECLAIMS PULP FIBRE AND FILLER!

Does *your* white water go down the drain? Why not make a profit from this waste with the Permutit White Water Reclaimer! This equipment recovers a very high percentage of valuable pulp fibre and filler otherwise lost.

RE-CYCLES PROCESS WATER!

Where water is none too plentiful, the Permutit White Water Reclaimer is of vital importance. After the removal of pulp fibre and filler, it permits the economical re-use of process water. The White Water Reclaimer helps you cut process water costs!

Let Permutit show you how the White Water Reclaimer can turn your white water waste into profits these two ways! Write to the Permutit Company, Dept. PI-1, 330 West 42nd St., New York 18, N. Y., or to the Permutit Co. of Canada, Ltd., Montreal.

Permutit

FOR 34 YEARS WATER CONDITIONING HEADQUARTERS

cludes supervision over preparation and distribution of all advertising material for the company, including institutional, trade, and direct mail.

He will do work for all three divisions of St. Regis, multiwall bags and packers, publication and converting papers and Panelyte, the plastic section of the big corporation.

Mr. Grandbois began his business career with the General Gas Light Company in 1922 in the order department and later handled the concern's national advertising and sales promotion. During this period he earned a degree at Kalamazoo College with a major in economics and business administration.

From 1933 until 1943 when he joined Bryant, Mr. Grandbois was with the Rex Paper Company, Kalamazoo, as merchandising advisor and later as sales manager. In his new position he will maintain his residence in Kalamazoo, commuting between his home and his New York office.

◆

WYANDOTTE MAKES CHANGES IN STAFFS OF RESEARCH AND DEVELOPMENT DEPTS.

Promotion of Paul Weller to the position of director of market research has been announced by Wyandotte Chemicals Corporation (Wyandotte, Mich.). He succeeds Melvin E. Clark, now one of the company's sales managers.

Mr. Weller has directed the activities of the department since last March. He has had engineering experience with Goodyear Tire and Rubber Company, and has compiled market research statistics for another national organization.

Also announced was the addition of Marvin S. Carr and Russell A. Kaberg to the staff of the development department. Dr. Carr will serve as assistant to the director of development, Joseph J. Schaefer. Mr. Kaberg will be a field representative in connection with the various organic chemicals that are being developed by the Wyandotte organization.

Dr. Carr was formerly a research and development engineer of the Electrochemicals Department of E. I. du Pont at Niagara Falls. Prior to joining Wyandotte, Mr. Kaberg was a member of the development department of Monsanto's Organic Division, and a rayon chemist at the du Pont Grasselli Chemicals Department Experiment Station.

Left to Right—Robert Caine, Marshall Rutz, Clifford Skinner

◆

WORKS MANAGERS APPOINTED FOR TWO INGERSOLL PLANTS OF THE BORG-WARNER CORP.

Works managers were recently appointed for the Chicago and Kalamazoo, Michigan, plants of Ingersoll Steel Division, Borg-Warner Corporation. The Chicago post goes to Joseph A. White, former general superintendent of the Columbia Steel Company at Pittsburg, California. The Kalamazoo post will be filled by Milo F. McCammon, who has been assistant works manager there for the last year.

Robert S. Ingersoll, who formerly served as works manager for both plants, now will be enabled to devote his full time to his duties as vice president on the Ingersoll Steel Division in charge of manufacturing at the Chicago, Kalamazoo and Evansville (Ind.) plants.

Left to Right—Paul Weller, Marvin S. Carr, Russel A. Kaberg

PERSONNEL CHANGES AT KVP

R. A. Hayward, president of the Kalamazoo Vegetable Parchment Company, Parchment, Michigan, has announced seven promotions in a pre-New Year reorganization and redefining of responsibilities in the supervisory personnel of the mill. The general overhauling came, he said, as a result of expanding operations, deaths, and retirements.

Robert Caine, former superintendent of the wax and parchment divisions, has been promoted to manager of converting operations. This assignment adds the printing division to his former responsibilities. Mr. Caine is president of the Kalamazoo Foremen's Club, an organization of 600 members.

Marshall Rutz, former superintendent of parchment production, was made superintendent of all converting in the parchment division. His former assistant, Al Hamilton, moves into the position of superintendent of the parchment machine room.

In a similar change in Mill No. 2, Clifford Skinner was made superintendent of all converting operations in that mill, which includes the waxed, bond and specialty divisions. His former position, superintendent of waxed production, is taken by his previous assistant, Cobe Jager.

Taking the place of the late E. P. Marantette, superintendent of shipping in Mill No. 2 is Harold Dunton, former assistant to Mr. Marantette. Arnold J. Dunning, traffic manager, who had just received his Old Timer award as a 30-year man, announced his retirement as of January 1, when his place was taken by Melvin Lievense.

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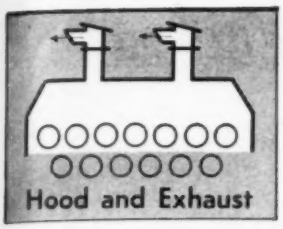
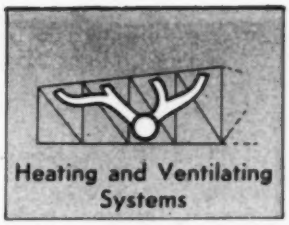
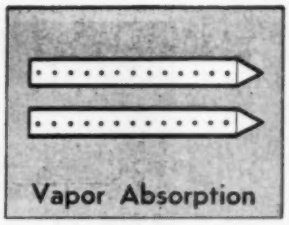
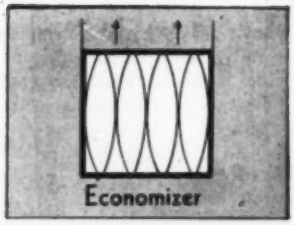
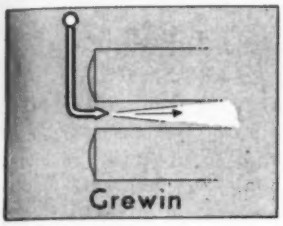
▶▶▶ Well known on the Pacific Coast, *Dave Watson*, of Longview, Washington, has been named vice president and manager of the Lynch Lumber Company, Longview. Mr. Watson was formerly purchasing agent for the Longview Fibre Com-

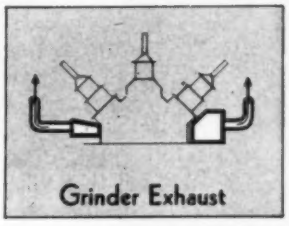


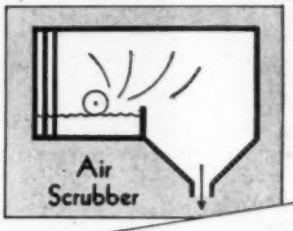


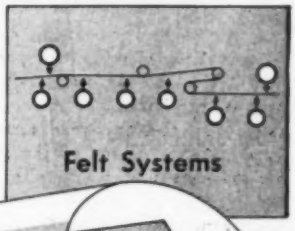












212 ROSS Systems

during 12 months *(Sept. 1946 to Sept. 1947)*

This exceptional 12 month volume of business in ROSS Systems proves, (1) the all-important factor that air handling plays in the efficient operation of pulp, paper and board mills, and (2) the recognized effectiveness of ROSS Systems for handling air with maximum efficiency.

Machine Hoods	64	Grewin Systems	24
Heating & Ventilating Systems	39	Air Make-Up Units	15
Vapor Absorption Systems	21	Water Heating Systems	3
Trim Conveying Systems	12	Generator, Motor, etc. Cooling	7
Calender Cooling Systems	3	Yankee Air Systems	6
Bottom Felt Systems	6	Grinder Exhaust Systems	10

Economizers-322 Sections 12

ROSS SYSTEMS

J. O. ROSS ENGINEERING CORP.

DESIGNERS AND BUILDERS OF AIR PROCESSING SYSTEMS

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ROSS CONTROL OF AIR FOR MODERN INDUSTRY SYSTEMS

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ROSS ENGINEERING OF CANADA, LIMITED — MONTREAL 19, P. Q.

CARRIER—ROSS ENGINEERING COMPANY, LIMITED, LONDON, ENGLAND

pany. The Lynch company is a wholly-owned subsidiary of the Pacific Paperboard Company, and supplies the paper company with groundwood.

◆

CLYDE MARTIN ELECTED PRESIDENT OF SOCIETY OF AMERICAN FORESTERS

Clyde S. Martin, chief forester for Weyerhaeuser Timber Company (Tacoma, Wash.), has been elected president of the Society of American Foresters for the two-year term 1948-1949 by mail ballot of the members. He succeeds Shirley W. Allen, professor of forestry at the University of Michigan. Mr. Martin served as vice president during 1946-1947.

A graduate of the Yale University School of Forestry, he has been in industrial forestry during most of his career, principally in the Pacific Northwest. From 1920 to 1930 he was forest engineer for the Government of India and later chief forest engineer for the Government of Madras. Recently he was elected trustee of the American Forest Products Industries, Inc.

◆

▶▶▶ *Earl W. Dilg* has been appointed district manager of The Patterson Foundry & Machine Company, East Liverpool, Ohio, with headquarters in Cincinnati. His previous experience includes the positions of chief engineer and sales manager of International Engineering, Inc., of Dayton, Ohio, and general manager of The Gem City Engineering Company, of Dayton.

◆

▶▶▶ Appointment of *Roger C. Sonnemann* as industrial relations director for the Monsanto Chemical Company plant in Everett, Massachusetts, has been announced. Mr. Sonnemann was first employed by Monsanto in St. Louis in 1940. He was transferred to Everett in 1942 and was appointed superintendent of the sulphuric acid department there in 1946.

◆

MOORE & WHITE APPOINTS FARRA AS SALES ENGINEER

Appointment of Harry J. Farra, as a sales engineer, has been announced by The Moore & White Company, Philadelphia. Mr. Farra has been head of the Paper Machinery Sales Division of Delaware; previously he was chief enginer. During the war he was with the engineering division of the Hercules Powder Company.

Before the war, Mr. Farra completed 30 years of service with the Pusey & Jones Corporation, Wilmington, Delaware. During that time he progressed from the position as draftsman to shop inspection, then estimating. He later became a sales engineer on both paper and general machinery.

He is a member of the Technical Association of the Pulp and Paper Industry.

Clyde S. Martin

Earl W. Dilg

Harry J. Farra

◆

WM. F. JIBB MADE EDIT. DIRECTOR OF AMERICAN FOREST PRODS. INDUSTRIES

The former chief of public relations of the Florida Forest Service, William F. Jibb, has been named editorial director of the American Forest Products Industries, Inc., Washington, D. C. He succeeds Ben K. Weatherwax, who is entering his own business in the State of Washington.

Mr. Jibb is from the South; a native of Arkansas, educated in Florida. Following his graduation in journalism from the University of Florida, he had a wide experience in newspaper work and radio. He also held a number of important posts in the Navy during the war. He joined the Florida Forest Service in 1946 and has been particularly active in publicity for the "Keep Florida Green" program.

◆

RAYONIER, INC. ANNOUNCES TEN EXECUTIVE PROMOTIONS

Higher positions have been given to ten executives of Rayonier, Inc. (Hoquiam, Wash.), according to an announcement by Edward Bartsch, president.

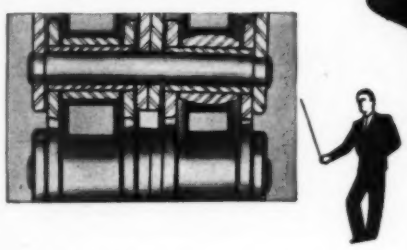
William S. Lucey, a director and also vice president in charge of plant operations, has been elected executive vice president. Mr. Lucey had been associated with Eastman Kodak Company from 1907 until 1917 when he joined the Hammermill Paper Company as chief engineer. In 1928 he became resident manager of the Grays Harbor Pulp & Paper Company at Hoquiam which is now Rayonier's Grays Harbor Division. He was elected a vice president in 1945.

Martin N. Deggeller, vice president in charge of the Timber Division since 1944, was elected a director and also a member of the Executive Committee of the company. Prior to joining Rayonier in 1937, Mr. Deggeller was connected with James D. Lacey and Company, Chicago.

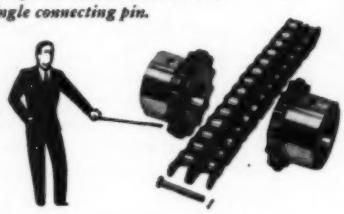
George Cropper, who has been resident manager of the Shelton Division (Shelton, Wash.) since 1937, has been appointed resident manager of the Grays Harbor Division and will continue supervisory control over the Shelton operations. Winston Scott,

this Coupling gives you *True flexibility* without backlash!

1. *True flexibility...maximum shock-absorbing ability because pins bend.*



2. *Easily installed or disconnected with single connecting pin.*



3. *All-steel. No short-lived material.*

● Baldwin-Rex Tru-Flex Couplings give you true flexibility without destructive backlash. These efficient chain couplings with their exclusive convex rollers on one chain strand give you better all-round performance . . . more protection for your machines . . . longer service. Here's why:

The convex rollers maintain only line contact with sprocket teeth and because of this contact, pins are designed to flex or bend. The flexing of the pin, plus the inherent flexibility of roller chains, accommodates misalignment, allows end play, and absorbs greater torsional shock loads. Too, this design permits the chain to be fitted snugly around the sprockets as contrasted to the "sloppy fits" of ordinary chain couplings. This, plus the fact that no short-lived materials are needed to give flexibility, makes it easy to see why Tru-Flex Couplings will give you longer, more efficient service.

For all the facts on Tru-Flex Couplings . . . how their single pin construction makes installation and disconnecting easy without an axial shift of either shaft . . . how they dampen pulsating loads . . . and their many other features, send for your copy of Bulletin No. 48-6. Address Baldwin-Duckworth Division of Chain Belt Company, 367 Plainfield Street, Springfield 2, Mass.

BALDWIN·REX

ROLLER CHAIN COUPLINGS

BALDWIN-DUCKWORTH DIVISION OF CHAIN BELT COMPANY

who has been assistant resident manager at Shelton, has been named to succeed Mr. Cropper as resident manager there.

The responsibilities of industrial relations manager for the company have been assumed by Lyall Tracy, who has been resident manager at Grays Harbor since 1942. Steve Rupert has been promoted from the position of pulp mill superintendent at Shelton to that of assistant resident manager. John B. Gray, assistant plant engineer at Grays Harbor since joining the company in 1945, has been named assistant resident manager of that division.

Dr. Robert E. Brown, assistant to the resident manager at the Grays Harbor Division since 1946, is going to the New York office to be an assistant on technical sales to Dr. R. M. Pickens. Fred B. Doherty, pulp mill shift superintendent at Shelton since 1946, has been made pulp mill superintendent, and Clarence H. Ahsler of the New York office has been appointed assistant comptroller.

◆

▶▶▶ Appointment of *G. A. Cowan* as sales manager of the new Celatom products department of the Eagle-Picher Sales Company, Cincinnati, has been announced. The new department was created to distribute Celatom, a diatomaceous earth product, which has wide industrial use as a filter-aid, high temperature insulation and as a filler for paints, plastics, polishes and paper. Eagle-Picher entered this field a year ago with the acquisition of a large diatomaceous earth deposit in Clark, Nevada. (Cf. P.I. and P.W., December, 1947.)

◆

RETIREMENT OF WM. T. BRUST ANNOUNCED BY HAMMERMILL PAPER CO.

The retirement on January 31 of William T. Brust, vice president and assistant treasurer of Hammermill Paper Company, Erie, Pennsylvania, has been announced. It is stated that Mr. Brust will continue as a member of the board and on a part-time basis.

Mr. Brust has been a member of the Hammermill organization for 25 years. In 1926, he became a member of the Hammermill board of directors, and in 1927 was made a member of the executive committee. He is a director and vice president of Hammermill Canadian Limited; a director and treasurer of Grays Harbor Pulp and Paper Company; a director of Robeson Process Company, and a director and president of Temperance River Company.

During World War II, Mr. Brust was a member of the Pulpwood Industry Advisory Committee, a division of the WPB. After that committee was dissolved, he served on the Eastern Pulpwood Industry Advisory Committee, and the Canadian Pulpwood Industry Advisory Committee. He is a director of the American Pulpwood Association and a member of the Committee on Imports for the American Pulpwood Industry.

◆

STRATHMORE APPOINTS 4 NEW DIRECTORS—RIGGS MADE A VICE PRESIDENT

At the annual meeting of Strathmore Paper Company on November 15, four new directors were elected. These men, who represent many years

Harry E. Riggs

of service with the company are: Harry E. Riggs, William A. McGilpin, Lawrence W. Shattuck and Roy F. Arnold. All officers and other directors were re-elected.

At the directors' meeting which followed the annual meeting, Harry E. Riggs was elected vice president in charge of sales. Mr. Riggs has been with the company since 1913 and has been associated with sales and advertising.

The appointments of Paul A. Wilks and George Maxwell as assistant treasurers also is announced.

◆

SEVERAL ADMINISTRATIVE CHANGES ANNOUNCED BY NATIONAL GYPSUM CO.

Broad changes have been made in the administrative organization of the National Gypsum Company (Buffalo, N. Y.) to cope with the threefold growth in the company's volume of business in the last ten years.

Lewis E. Sanderson, for several years superintendent of construction, has been named vice president in charge of operations. Mr. Sanderson succeeds Gordon H. Tarbell, who has reached retirement age. Mr. Tarbell, one of the company's founders, continues as a director and as an adviser on production.

Dean D. Crandell, who has been vice president in charge of research, was promoted to vice president in charge of sales and advertising. In his new post, he assumes duties formerly handled by Ralph F. Burley, who is on leave of absence because of illness.

Charles E. Masters, controller, has been elevated to the new position of vice president in charge of accounts. Frank L. Marsh was promoted to director of research, succeeding Mr. Crandell.

The company has created an administrative planning department, headed by William T. Davidson, who has been with National Gypsum since 1935.

◆

▶▶▶ The promotions of *N. George Belury* and *Harry C. Platt* have been announced by the American Brake Shoe Company, New York. Mr. Belury, formerly sales manager, is

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The Red Book of the British Paper Industry

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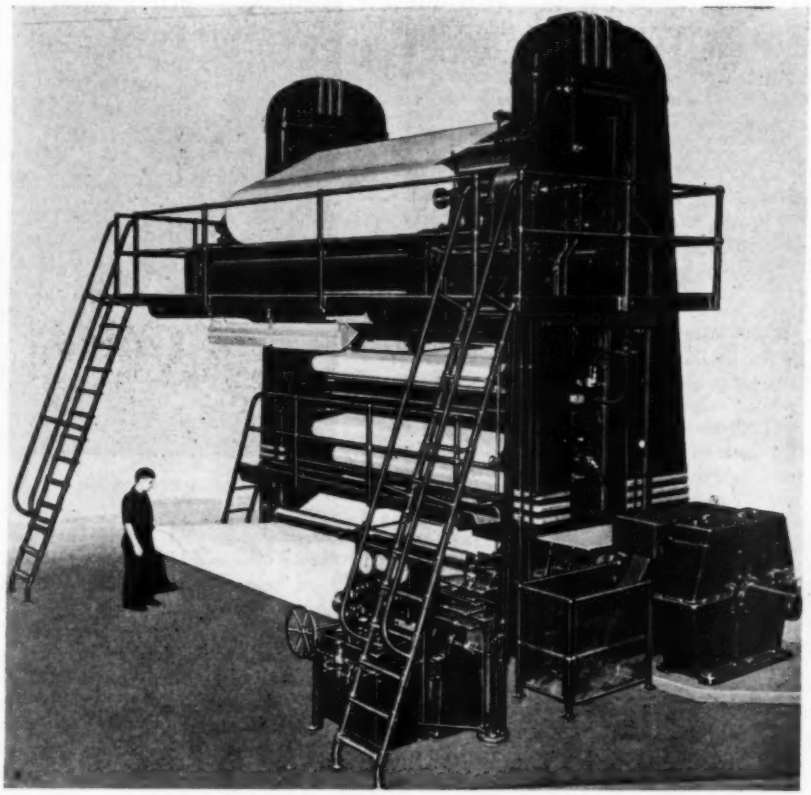

COMPLETE SUPERING EQUIPMENT FOR THE PAPER INDUSTRY

APPLETON

Superfinishing Equipment

The new supercalender room at the Blandin Paper Company, Grand Rapids, Minnesota, is a good example of the trend to greater efficiency and high-speed finishing in the modern paper mill. The illustration shows a recently installed 76 inch, 10 roll Appleton Super-stack operating at a speed of 1,600 feet a minute. It is equipped with the Appleton Hydraulic Pressure System, Appleton Enclosed Oil Feed System, Appleton Operating Control Panel, Appleton New-Process Filled Rolls, Appleton Unwind Reel, Appleton Windup Reel with Electric Tension, Appleton Friction Brakes and Torrington Anti-friction Bearings.

THE APPLETON MACHINE COMPANY • Appleton, Wisconsin

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now vice president of the Engineered Castings Division of the company, and Mr. Platt, formerly division metallurgist, is now works manager. Both men will continue to be located at the Division headquarters in Rochester, New York.

◆

▶▶▶ Promotions announced by The Gardner-Richardson Company, Lockland, Ohio, include: *Sam W. Yates*, who has been put in charge of operations at the Dairypak, Inc., plant in Cleveland; and *Duncan S. Brown*, who has been made plant manager. Dairypak, Inc., is an associated company recently organized by Gardner-Richardson.

◆

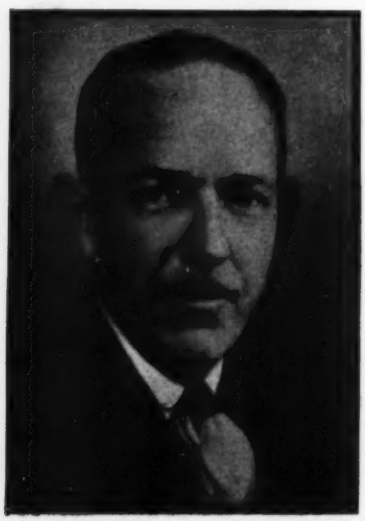
▶▶▶ The American Car and Foundry Company, New York, has announced the appointment of *Jerry M. Gruitch* as director of research and development. Prior to joining ACF he was assistant chief engineer at the Dodge Division, Chrysler Corporation, on the design and development of power plants and accessories, and later, vice president in charge of engineering and a member of the board of directors of O. A. Sutton Corporation, Wichita, Kansas.

◆

DIAMOND MATCH COMPANY RELEASES NAMES OF TWO NEW VICE PRESIDENTS

Election of Victor R. Kendall and Bradford O. Preu as vice presidents of Diamond Match Company, New York, has been announced.

Mr. Kendall, new vice president in charge of sales of matches and allied products, joined the company in 1931 as a retail match salesman. He was named general sales manager of the company in 1943. Mr. Preu, vice president in charge of the B-F-D Division, was vice president and treasurer of the B-F-D Company until its merger with Diamond last spring and has been serving as manager of the new division.



Bradford O. Preu

The appointment of Stillman Kuhns, former general auditor, as comptroller of the company also was announced.

◆

ALBERT ERNEST BECOMES EXECUTIVE OF FLORIDA PULP & PAPER COMPANY

Albert Ernest, former president of the Dixie Wood Company, has joined the Florida Pulp & Paper Company, wholly-owned subsidiary of St. Regis Paper Company, in an executive capacity and will be in charge of land acquisition and timber production along the Atlantic seaboard. In the past Mr. Ernest also had served as manager of the Woodlands Division of Union Bag & Paper Corporation.

A major responsibility of Mr. Ernest according to James H. Allen, president of Florida Pulp & Paper Company, will be the production development of the Superior Pine Products Company timber holdings in Georgia, which the company recently acquired the right to manage and utilize. Mr. Ernest will maintain a company office at Savannah, Georgia.

NECROLOGY

EDWARD T. STREET

News of the passing of Edward T. Street, president and sales manager of Downingtown Manufacturing Company, Downingtown, Pennsylvania, was received as this issue was ready for the press. Mr. Street passed away suddenly in the early morning of January 7, 1948. He had been at his office the preceding day and was seemingly in the best of health.

Mr. Street had been president of Downingtown Manufacturing Company for about a year and a half, prior to which he was vice president in charge of sales; before that, he was chief engineer. He contributed much to various improvements in design of the company's products and was especially active in the development of Downingtown Wallboard Machines which have been accepted and used by many producers in this country and abroad.

Before his association with the Downingtown company, Mr. Street

Edward T. Street

was for ten years chief engineer of the Rubberoid Company. Prior to that, he was with the Minnesota and Ontario Paper Company.

A native of Ohio, Mr. Street was a graduate of Oberlin College. He was a member of the American Society of Mechanical Engineers and the Technical Association of the Pulp and Paper Industry.

Survivors include his widow, a son, and two daughters.

◆

WILLIAM HEISER

A member of the Harris-Seybold Company of Cleveland for more than thirty-five years, William Heiser passed away in his Long Island home December 12 at the age of 70.

Mr. Heiser joined the Harris Automatic Press Company in 1911 as a press erector and serviceman following considerable experience as a pressman with the Hill Publishing Company. In June, 1947, he was promoted from Eastern District service manager to special representative for Harris-Seybold.

He is survived by his widow and three daughters.

◆

▶▶▶ *Cornelius P. Carey*, retired manager of Mohawk Paper Company's plants at Cohoes and Waterford, New York, passed away recently in Albany, New York, at the age of 82. Mr. Carey began his career with the International Paper Company and later joined the St. Regis Paper Company as a superintendent.

◆

▶▶▶ A retired paper manufacturer, *Joseph Eli Colton*, passed away in Pittsfield (Mass.) late in November at the age of 89. Mr. Colton had conducted a weekly newspaper in Fair-

haven, Vermont, before purchasing the Valley Paper Company in Pittsfield. He was connected successively with the Owen Paper Company, the Berkshire Typewriter Paper Company, and Eaton, Crane and Pike until his retirement in 1928.

◆

▶▶▶ Chairman of the board and former president of Knowlton Brothers, Inc. (Watertown, N. Y.), *G. Seymour Knowlton*, passed away December 14. He was 83 years of age. He had participated actively in the business of Knowlton Brothers until last March.

◆

FREDERICK J. ROONEY

Frederick J. Rooney, who in recent years represented the Wisconsin Wire Company (Appleton, Wis.) in the sale of paper machine wires throughout the eastern and middle Atlantic states, passed away December 17 after a brief illness.

Mr. Rooney was best known as a paper mill production executive. He served as mill manager with the National Paper Mill (Ballston Spa, N. Y.) and as superintendent of the Upson Board Company (Lockport, N. Y.). While superintendent at the Upson mill, he was elected president of the American Pulp and Paper Mill Superintendents Association and served two terms (1927-1928).

He is survived by his widow and two sons.

◆

▶▶▶ A former member of the Hammermill Paper Company (Erie, Pa.), *Harry S. Harcourt*, 80 years old, passed away recently in Erie. Mr. Harcourt had retired from the company in 1946 after serving with the firm for forty-seven years.

◆

▶▶▶ Superintendent of the soda department of the International Paper Company plant in North Tonawanda (N. Y.) for the last twenty-five years, *Raymond J. Smith*, passed away recently at the age of 56. His wife and two sons survive.

◆

▶▶▶ Prominent in Northwest pulp and paper circles, *Ambrose Cronin*, was killed in the crash of a helicopter at Portland, Oregon, on December 21. Forty-three years of age, Mr. Cronin was director and secretary of the Oregon Pulp and Paper Company, director and secretary of the Columbia River Paper Company, and a director of Columbia River Paper Mills, in addition to holding various other executive positions in other industries and businesses.

MATERIAL HANDLING News

Here is the one and only method of handling many types of unit loads that does not require conventional pallets or skids . . . practical to the Nth degree, and destined by its merits to be perpetually modern . . . offers unparalleled opportunities for big savings . . . a method made possible by Clark's revolutionary new handling tool—the PUL-PAC.

The PUL-PAC is a "push-pull" attachment **which enables a Clark fork truck to lift, carry and tier many types of material assembled in unit loads based on disposable or durable sheets of corrugated paper, fiber-board or similar inexpensive material.**

PULLS THE LOAD ONTO THE LOAD-PLATE

This unique device consists of a vertical sliding rack which travels horizontally above the truck's wide load-plates, with a gripper device at its base. To pick up a load, the rack is moved forward and the gripper opens automatically to receive the projecting edge of the load-base sheet. When the rack is retracted, powerful hydraulic pressure closes the gripper firmly upon the load-base sheet; the load then is pulled onto the load-plate. See picture No. 1. Lifting, tilting and lowering are done in the usual manner.

1. Pulling the Load Onto the Load-plate

2. Pushing the Load Off at Destination

PUSHES THE LOAD OFF AT DESTINATION

At destination, the operation is reversed. The "push" mechanism is used to hold the load over the desired area while the load-plate is removed.

TIERS UNIT LOADS SECURELY

With the PUL-PAC, maximum compactness can be achieved both in storage and in freight car and trailer shipments; this is an economic advantage of paramount importance.

The PUL-PAC has been tested for months in various installations and has proved highly successful in handling many kinds of packaged materials.

Full details on this remarkable new materials handling method and device may be obtained quickly by writing to the Clark Equipment Company, Tructractor Division.

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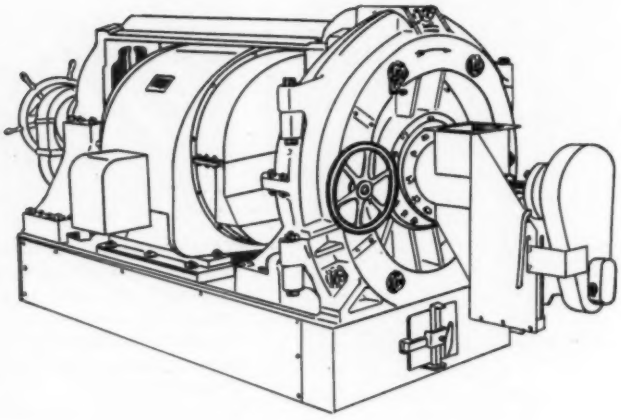
CLARK EQUIPMENT COMPANY, TRUCTRACTOR DIVISION, BATTLE CREEK 22, MICH.
REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

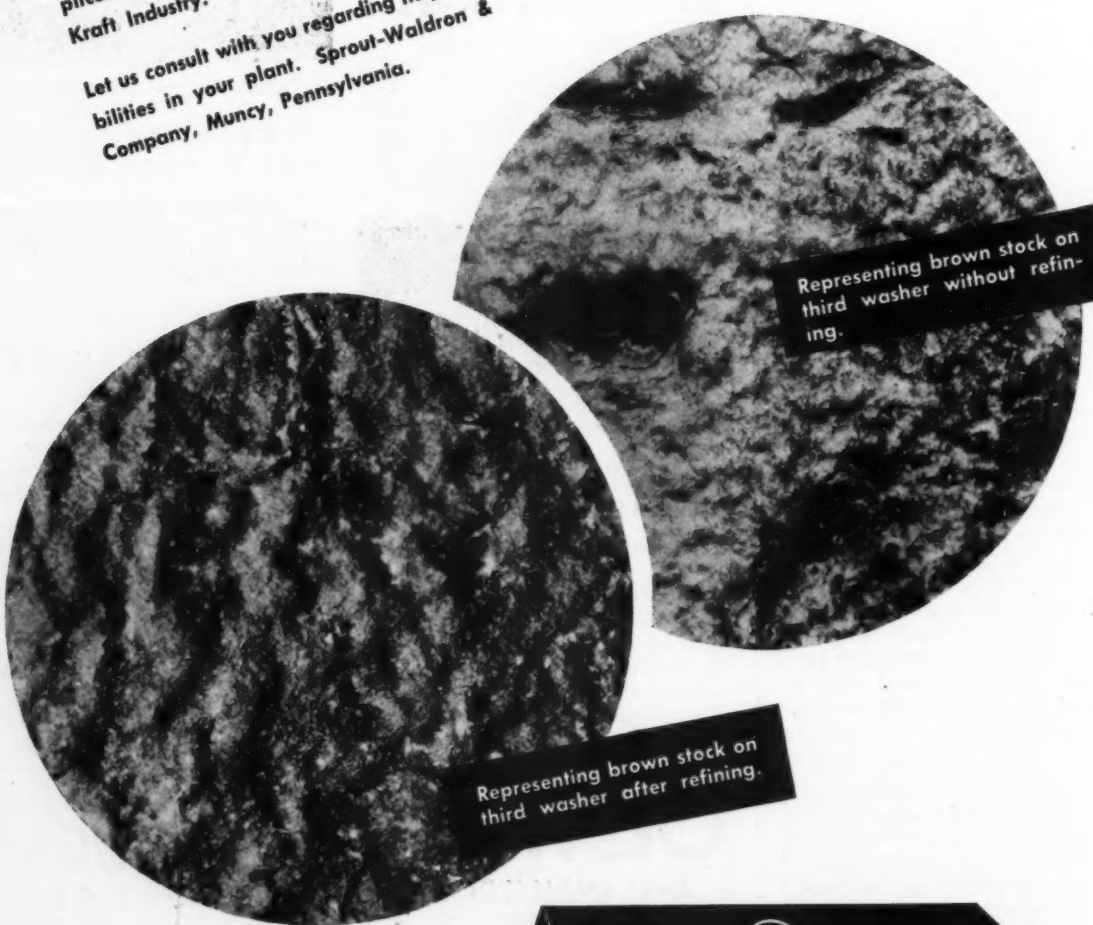
Brown stock refining in hot liquor . . .



Sprout-Waldron Refiners placed between the blow tanks and the washers save wood and chemicals, and permit improved evaporation.

Unusually high capacities on this service, with correspondingly low specific power inputs, make this SPROUT-WALDRON application an attractive investment for the Kraft Industry.

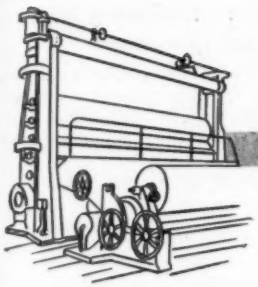
Let us consult with you regarding its possibilities in your plant. Sprout-Waldron & Company, Muncy, Pennsylvania.



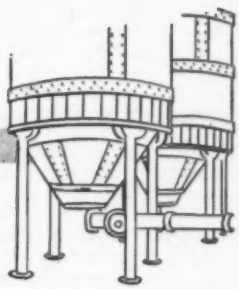
Representing brown stock on third washer without refining.

Representing brown stock on third washer after refining.

SPROUT WALDRON
Manufacturing Engineers



Practical SHORTS



Readers are invited to submit short, practical articles for this department. The items should be original and should relate to ways and means of handling production and maintenance jobs. Where possible, articles should be illustrated. Rough sketches only are required. Payment will be made for acceptable items upon publication.

Driving a Nail With One Hand

If it is necessary to hammer a nail with the use of only one hand, proceed as follows: Insert the nail between the hammer claws (Figure 1 of illustration) with the head of the nail against the base of the hammer head, so that the nail remains rigidly in position. Drive the nail deep enough with the first blow so that it will remain in the wood until struck again with the face of the hammer.

Another method of hammering a nail with one hand is shown in Figure 2. In this method, proceed as follows: Grasp the hammer head so that the side of it will be used for driving. Hold the nail head against the side of the hammer, and drive the nail deep enough with the first blow so that it will remain in place to be struck again in the usual manner.—Adapted from Shop Work (TM 11-453, Cl) War Department Technical Manual.

◆

How to Compute Steam Flow Through a Pipe Without a Steam Flow Meter

It is not always necessary or economical to use an expensive steam flow meter for determining the weight of steam flowing through a given pipe. Nor is it necessary to use orifices and elaborate testing equipment. Nor is it necessary to condense the steam and weigh the condensate, or to watch the boiler gauge glass and to attempt to roughly compute steam flow in that manner as is sometimes done in spite of the usual inaccuracy of this latter method. Steam flow can be determined by the simple application of Babcock's well known steam flow formula. The result will not always be 100 per cent accurate, to be sure, but in many instances it will be sufficiently accurate for an approximate test and may lead to a decision to make an accurate test later or to install a steam flow meter.

All that is necessary, to make use of Babcock's formula in this manner, is to select a straight run of pipe and tap two ordinary but accurate pressure gauges into the pipe a known distance apart. The farther apart the better. Then, knowing the exact internal diameter of the pipe and the simultaneous pressure gauge readings of the two gauges the determination of steam flow becomes a mere matter of applying the formula—

$$W = 87 \sqrt{\frac{p\ D\ d^5}{\left(1 + \frac{3.6}{d}\right) L}}$$

where W = the weight of steam flowing through the pipe in pounds per minute

D = the density of the steam or weight in pounds of one cubic foot of steam at the mean average between the two gauges

p = the difference in pressure between the two gauges in pounds per square inch

d = the accurate internal diameter of the pipe in inches

L = the distance between the two pressure gauges in feet

For example, suppose two pressure gauges are placed in a one-inch pipe, 100 feet apart. One gauge registers 5 lb. pressure; the other, 15 lb. How many pounds of steam are flowing through the pipe per minute?

Referring to the formula:

L = 100 ft.

p = 15 — 5 = 10 lb.

The average steam pressure = $\frac{15 + 5}{2}$ = 10 lb.

From steam tables, D (the weight of one cubic foot of steam at 10 lb. gauge pressure) = 0.0606 lb.

From handbook giving standard pipe dimensions, d = 1.049 in.

Substituting:

$$W = 87 \sqrt{\frac{10 \times .0606 \times 1.049 \times 1.049 \times 1.049 \times 1.049 \times 1.049}{1 + \left(\frac{3.6}{1.049}\right) \times 100}}$$

Completing the calculation the answer is 3.62 lb. of steam per minute.—W. F. Schaphorst, M.E.

Water Softener

For workers in occupations necessitating frequent handwashing, it is particularly desirable during these winter weeks that the water used to wash the hands be softened in order to prevent as far as possible chapping and roughness. The following simple glycerine mixture is advocated by a number of users:

Glycerine	10
Borax	3
Sodium carbonate	2
Orange flower water, triple	85

(A tablespoonful to a basin of water is usually sufficient.)—Glycerine Producers' Association.

◆

How to Use a Cross-cut Saw

The correct position for cross-cutting is shown in Figure 1. An imaginary line through the saw, arm and shoulder would be slightly to the left of the saw blade, permitting view of the line where the work is to be cut.

To start the cut, rest the blade on the waste side of line, support the side of the blade with the thumb and draw the saw toward you a few times until a slight groove is formed; then cut straight with a full stroke.

In cross-cutting, it is best to maintain an angle of 45 deg. (Figure 2) between the saw and the face of the work. Extending the forefinger along the side of the handle aids in guiding the blade. Take long, easy strokes and make each stroke do its work.

Supporting the waste side of the work will prevent the wood from splintering on under side when cut is nearly completed.

Figure 1

Do not twist off waste with the saw blade.

Look carefully at repair work to see that there are no nails in the path of saw. Don't throw your saw around; keep blade covered with a thin

Figure 2

coat of light oil and hang it up when not in use.—*Disston Saw, Tool and File Manual*, HENRY DISSTON & SONS, INC.

◆

What Do You Mean by Careless?

The term "carelessness" has been kicked about and used as a designation of cause of accident by safety inspectors and workers for years until it has become practically a word without meaning. At least it means different things to as many persons as you ask for a definition. Its utilization should be outlawed by all those concerned with preventing accidents. We should further encourage and educate others to shun the term and to use the proper descriptive term; untrained, unskilled, obstinate, disloyal, unsupervised, unsuited to job, etc.—instead of just "careless."

Carelessness is only a symptom. To the same degree that "carelessness" causes accidents, it causes wars, epidemics, depressions, broken homes, business failures and other misery and suffering that we never seem satisfied to charge to "carelessness" and leave at that. It's about time that safety engineers removed this stumbling block "carelessness" by insisting (a) that we refrain from using it ourselves; (b) that we do not use it in any safety posters, safety instruction, etc. viewed and absorbed by workers; (c) that we strive in all reasonable ways in our conversation, writing, discussions, and confirmation letters to shy away from use of the terms "careless" and "carelessness."—AMERICAN MUTUAL MAGAZINE (July, 1947).

◆

Tips on Grinding Chilled Iron Rolls

Take light cuts. A light cut does not wear the wheel as rapidly and the diameter of the roll is apt to be more uniform throughout its length. Experienced operators are able to determine the approximate depth of cut by listening to the cutting sound of the wheel. The proper work speed depends mostly on the proportions of the roll and the finish requirements. It appears to be common practice to run chilled iron rolls up to 20 in. in diameter at about 85 sfpm and rolls larger than 20 in. at about 110 sfpm. Long, slim rolls have a tendency to whip and set up vibration which can be offset by reducing their speed.

Clean, carefully filtered coolant, directed between the wheel and the work in a generous flow, is essential for a surface that is to be perfectly round and free from scratches and other imperfections. On the two-wheel type of roll grinder, care must be taken to have the coolant fed over the grinding wheel that is running down. In this position, the water is carried by the roll to the other wheel. Strong alkali coolants should be avoided as these have a tendency to attack the shellac bond, resulting in rapid wheel wear and scratches on the roll surface.

Operators who are troubled with chatter marks should make sure that the wheel spindles on their machines are not loose, the driving dogs are not too tight (or too loose), the grinding solution of the correct strength, and the grinding wheels not too hard. In grinding long, slender chilled iron rolls, it is sometimes necessary to raise the roll above centers in order to eliminate chatter marks. Due to its own weight, the center of the roll sags below the center line of the wheels and by shimming up the bottom gib (on two-wheel grinders) and raising the center line of the roll ⅛ in. to ¼ in. above the center line of the wheels, the grinding action is improved perceptibly.

It is desirable to use a special roll caliper to check the roll for roundness and straightness (or amount of crown). The indicator needle should not deflect if the roll is perfectly round. To prevent the caliper from chattering, the rolll should be wiped with the grinding solution or oil.—NORTON COMPANY.

◆

Special Considerations for Squirrel-Cage Induction Motors

Loose and Broken Bars. Overheating and violent jarring ruin squirrelcage rotor windings by breaking bars and separating them from the end rings to a point where the motor will not operate satisfactorily. A broken bar or joint may be located by a growler.* Where excessive vibration or repeated shocks have loosened bars in large motor rotors, the condition should be reported so that the bars may be firmly rewedged.

Impedance Test. To test for open-rotor bars, apply 25 per cent voltage or less to one stator phase (only sufficient voltage to give a suitable ammeter reading is required). Turn the rotor very slowly by hand or mechanical means, and observe variation in stator current. Any current variation in excess of 3 per cent usually indicates a defective rotor winding with open bars. If a doubt exists, an additional check can be made by turning the rotor one revolution and counting the number of ammeter pulsations. If caused by open bars, the number of pulsations will be equal to the number of poles in the stator winding.

***Growler**

A device for testing armatures; particularly for short circuits. A growler consists essentially of a primary coil and the primary portion of the iron of a transformer. The iron of the armature or stator under test completes the magnetic circuit. When an alternating current is passed through the growler it sets up an alternating magnetic flux in the iron core of the growler and in the iron of the armature or stator spanned by the jaws of the growler. As this magnetic flux passes through any coil of the device it induces a potential in the coil and if the coil is short-circuited a current will be set up in the coil. This current produces a load on the growler which sometimes changes the tone of the hum of the growler. It also sets up a magnetic field around the coil which shows up strongly across the opening of the two slots carrying the short-circuited coil. Growlers are made with or without meters for measurement of current in the primary circuit.—Preventive Maintenance of Electric Motors and Generators, TM55-405 WAR DEPARTMENT TECHNICAL MANUAL.

Calculation of Running Time and of Average Speed

The following paragraphs outline the calculations for two types of problems—(a) the running time for a given quantity of paper, and (b) the average running speed corresponding to a given pounds-per-hour production. The nomenclature used is:

Production in pounds per hour.....P
Quantity of paper in pounds .....Q
Time in hours .....T
Speed in feet per minute .....S
Roll width in inches .....W
Basis weight for 25x38—500 ream.....B

In planning production schedules it is necessary to know the running time for a given quantity of paper. The formula is:

$$T = \frac{Q \times 660}{B \times W \times S}$$

If the running speed for the operation is constant, it is convenient to combine 660/S as a factor for the calculation. The derivation for the equation is:

$$\text{Sq. in./ream} = 25\text{x}38\text{x}500 = 475{,}000$$
$$\text{Sq. in./hour} = S\text{x}W\text{x}12\text{x}60$$

$$\text{Reams/hour} = \frac{S\text{x}W\text{x}720}{475{,}000} = \frac{S\text{x}W}{660}$$

$$\text{Pounds/hr. (P)} = \frac{B\text{x}S\text{x}W}{660}$$

$$\text{Time (T)} = \frac{Q}{P} = \frac{Q\text{x}660}{B\text{x}W\text{x}S}$$

Calculations of average speed from pounds-per-hour production are useful in evaluating the production records of different machines or different operators. If the actual speed at which the machine was run is known, the ratio of this average speed to the running speed gives an index of the down time. For the calculation of average speed it is convenient to have a table of factors (F) such that the equation $S = FxP$ is satisfied. The factor will depend on the roll width and basis weight involved. The calculations are derived as follows:

$$P = \frac{B\text{x}S\text{x}W}{660} \text{ as shown above}$$

$$S = \frac{P\text{x}660}{B\text{x}W} \text{ by rearrangement}$$

$$S = PxF \text{ where } F = \frac{660}{B\text{x}W}$$

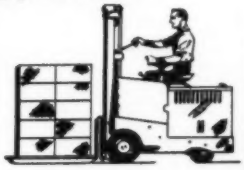
A table of factors is conveniently made with roll widths for the top headings and basis weights for the horizontal headings. The factors are then set down for the different roll widths and basis weights.

These calculations can obviously be made for different ream weights. They can also be set up on a simple nomograph. —VICTOR S. BURSTEIN, Chemical Engineer, Michigan Paper Company.

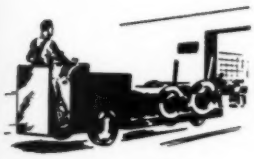
Operate Power Trucks Safely

Do's

Obey all traffic rules established to promote accident prevention. Slow down, sound warning and be alert at aisles, passageways and corners. Keep within the marked aisleways while transporting your load.



Load trucks properly and carefully. See that load is correctly stacked and balanced, and is well back on the forks. Hang a red flag on the end of long loads which extend beyond the truck.



Assist in seeing that only trained and properly qualified operators handle power trucks. Help to establish and comply with strict shop rules forbidding any unqualified employee from operating trucks. If possible, lock standing trucks.

Apply brakes when descending ramps and other down grades. Coasting may allow the truck to get out of control. Brakes must be kept in proper adjustment.

Drive carefully and slowly over rough spots in the roadway. Excessive speeding over rough spots may jar part of the load loose and cause injury to operator or persons nearby. Report rough spots in the floor to your supervisor immediately. Select smooth routes whenever possible.

Accelerate power trucks gradually, using all accelerating speeds. Apply brakes slowly to eliminate any tendency of the load to shift or fall off. Lift and lower loads smoothly.

Don'ts

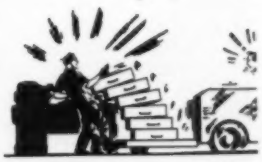
Don't ignore and break shop traffic rules. Do not drive around blind corners or through doorways without first stopping. Do not fail to slow down at dangerous crossings. Never operate too fast for existing conditions.

Don't load trucks without thought to the proper balance and alignment. Never overload a truck. Do not permit "riders."

Don't permit any unqualified person to handle your truck. Never leave trucks standing unlocked or otherwise usable by some unauthorized person. Do not train operators in congested parts of the shop. Do not carry "riders."

Don't descend ramps with clutch or brakes released, as the truck may get out of control. Never speed down grades or try to take turns quickly. Do not cut corners

Don't speed over rough spots, or drive over rough floors when smooth ones are available. Do not use narrow aisles and congested sections of the shop, when they can be avoided.



Don't try to jump trucks immediately to high speed, skipping intermediate accelerating points on the controls. Never drive so that brakes have to be applied suddenly, as this is apt to cause part of the load to fall off and injure some one.

Adapted from Industrial Safety Charts, Series C, U. S. Department of Labor

Pulp and Paper Industry and the Forest Economy of the Pacific NW*

E. W. TINKER, Executive Secretary
American Paper and Pulp Association

▶▶▶ IN DISCUSSING the position of the pulp and paper industry in the economy of the Pacific Northwest, I would like to point out one or two basic factual situations.

In the first place, the pulp and paper industry is not a migratory industry. The same mills that manufactured paper in New England are still manufacturing paper and the same pulp mills that were originally established in the State of Maine are still operating in that state. Even today New York State is the largest paper producing state in the Union. Once the industry is established in an area it becomes a permanent part of the economy and a permanent asset to the community and state in which it is located. Pulp and paper mills require very large investments. Approximately $20,000 is required for every worker employed. In the older sections of the country it is almost traditional that workers in the industry follow each other from generation to generation. The son of the skilled paper maker traditionally succeeds the father.

The enormous expansion in the use of paper and paper products, as our standards of living have risen, has resulted in great growth in the pulp and paper industry. The geographic trend in this growth has been dictated by the availability of supplies of raw material, particularly pulpwood, by cheap power and by adequate transportation facilities. This expansion is changing the entire economy of the Southern region. Forestry has become a profitable enterprise and new business has been created to an extent materially affecting the prosperity, not only of many communities, but of the rail roads, intercoastal shipping, and even the domestic agricultural economy.

From the viewpoint of the pulp and paper manufacturer, the West Coast offers potentialities that are indeed intriguing. However, the pulp and paper manufacturer must develop his plans on a long-time basis. A mill once established must operate not for ten or twenty years, but as far into the future as we can perceive. The extremely high capital investments that are required must be depreciated and this requires long periods of time.

You have in this region forest soils of very high productive capacity and a sufficient area of true forest land to sustain a large pulp and paper industry. The rapidly growing population on the West Coast obviously indicates this development, particularly as the expansion of the industry is dependent upon the availability of paper to the public as a cheap and plentiful commodity.

Basically, all of the conditions exist to encourage prudent developments although a major contributing factor will be the creation of an environment friendly to such developments.

It has been my experience that in the expansion of existing projects or in the initiation of new projects the public can depend upon the conservative judgment of bona fide investors and company executives responsible for investments. To be assured of the permanence of essential supplies of raw materials, as well as other factors, it is inevitable that the pulp and paper industry will contribute to a major degree to the profitable use of the forest lands of the West Coast. The industry's expansion will be dictated to a large extent by the environment that is offered. Such factors as an unreasonable tax environment, excessive fire hazards, turbulent labor conditions, and even an atmosphere of governmental unfriendliness, must be considered by executives in planning long-time investments in any territory.

(*) Address given before Western Forestry and Conservation Association, Portland, Oregon, December 11, 1947.

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In my judgment the limit of expansion in the pulp and paper industry in the United States has not yet been reached and I would like to repeat that such expansion in the Pacific Northwest would inevitably be a major contributing factor in the development of the forestry program in this region.

I have been intimately familiar with West Coast conditions for many years. Based upon my knowledge of your conditions and knowledge of developments that are taking place in other regions, I would like to make a forecast. I believe it inevitable that as time goes on an orderly development of the forest products industries of the West Coast will take place, that will assure the maximum use of all forest lands and the production of those products of highest economic value. The rapidity with which this orderly development will be brought about, while dependent upon general economic conditions to a degree, will, in my judgment, be much more dependent upon clear thinking and foresight on the part of your political and economic leadership. In the long run this development is inevitable.

Convention Papers . . . Abridged

Modern Bark Burning

MAYNARD H. SNODGRASS
Detroit Stoker Company

Abridgments in this section are from papers presented at the Second Engineering Conference of the Technical Association of the Pulp and Paper Industry held in Philadelphia, November 3-5, 1947

Several years ago, the West Virginia Pulp and Paper Company was faced with a triple problem that is not new in the industry. To expand its capacity, their Charleston, South Carolina, mill required first, more steam generating capacity; second, increased bark burning capacity; third, steam generating equipment that could be operated with either bark or coal fuel, or with a combination of both fuels.

Under the supervision of their chief engineer, Mr. C. J. Sibler, an investigation was made of many existing bark burning steam generating units, and a number of such installations were visited to determine how the proposed new unit should be designed to meet all three requirements of the problem. Each of the existing installations considered or visited was found to be lacking in one or more respects the features necessary to meet all of the requirements of the problem, and it was decided that it would be necessary to design an entirely new type of unit.

A careful study was made of the available bark fuel to determine the range of moisture and ash content and the ash fusion temperature.

It was found that during the different seasons of the year the moisture in the bark to be burned would vary from 24 per cent to 70 per cent and that the ash and non-combustible would range from 0.25 per cent to 21.7 per cent due principally to variations in the amount of sand on the pulpwood when received at the mill, and with minimum ash fusion temperature of 2140 Fahr.

The design work was started with this knowledge of the bark fuel and also bearing in mind the necessity of designing for alternately burning bituminous coal, and possibly bunker "C" fuel oil.

Experiments were made burning screened bark in suspension in the furnace of an existing pulverized coal-fired boiler. The bark was admitted through a spout near the top of the furnace and dropped through the pulverized coal flame. It was found that complete combustion could not be obtained in this manner with either dry or wet bark and the partially burned bark formed in a pile on the furnace floor. To burn the bark on the floor, air was admitted at the furnace floor level on four sides of the bark pile. The combustion air entered the furnace under pressure and was directed toward the burning pile by pipes through the furnace walls.

After these studies and experiments and discussions with various manufacturers, it was decided that a spreader type stoker probably offered the best possibilities for burning both bark and coal fuel.

To determine the ability of a spreader stoker mechanism to feed bark and to distribute it evenly over the required grate, typical samples of bark were shipped in tightly sealed drums from the mill to the Monroe, Michigan, works of Detroit Stoker Company. Twelve drums of unusually wet bark and additional drums of dryer bark were furnished, and care was taken to retain the moisture content.

A stoker feeder of the design contemplated was erected with all dimensions, including the proposed grate area, exactly duplicating the arrangement planned.

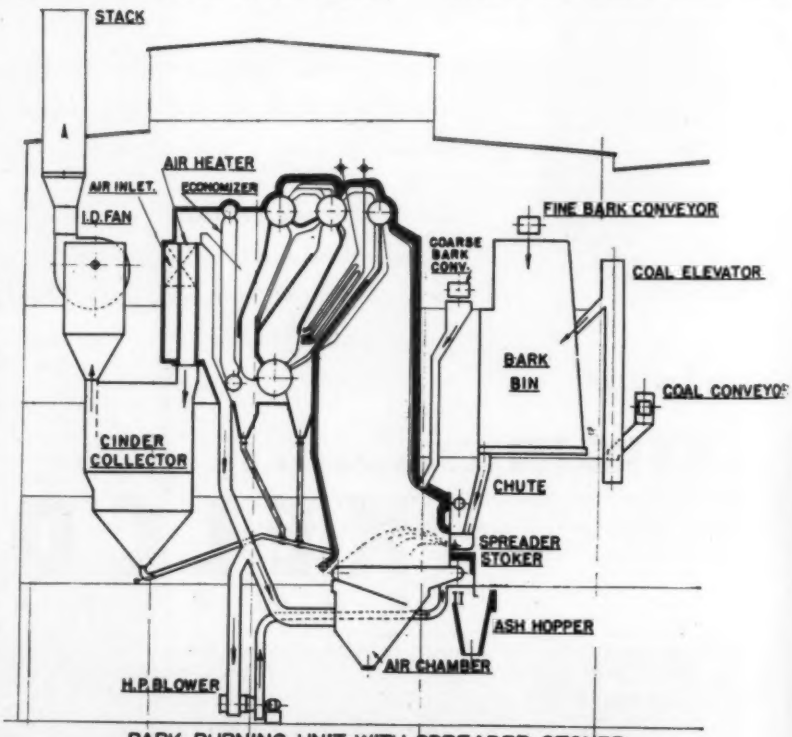
Provisions were made to experiment with a wide range of rotor speeds, various pressures, and volumes of auxiliary air.

Then the type of grate to be used was considered. It was agreed that for the normally low inherent ash in the bark an intermittently cleaned dumping type grate would be suitable; however, on account of the known high sand content in the bark and the greater volume of ash when burning coal, it was decided to use the traveling continuous ash discharge type of grate. This moves slowly forward and continuously discharges the ash into a hopper beneath the operating floor line.

In considering furnace design, it was borne in mind that wet bark burns slowly and with a long flame which indicated the desirability of the highest possible furnace. The engineers requested the Babcock & Wilcox Company to redesign the baffling of a standard B&W Stirling four-drum boiler to secure the maximum flame travel before the combustion gases entered the boiler.

Final operating conditions were established as shown in Table 1.

Complete unit includes boiler, water



BARK BURNING UNIT WITH SPREADER STOKER

Jacketed Drier Rolls Paid for Themselves in 268 Days!

THIS IS HOW IT WAS FIGURED

$$\frac{\text{Tons produced by machine per day}}{\text{Total number of drum driers}} \times 15\%^{*} = \text{Additional tons per Lukenweld Drier per day}$$

$$\frac{\text{Cost per Drier}}{\text{Additional tons} \times (\text{Operating Cost} + \text{Operating Profit})} = \text{Number of days for LW Rolls to pay for themselves}$$

*15% is the increased production per Lukenweld Drier and with all rolls (cast and Lukenweld) operating at only 50 psi.

A company which installed Lukenweld Jacketed Drier Rolls to replace several cast iron rolls in a drying machine showed that the Lukenweld Rolls paid for themselves in 268 days. This was the result of the 15% additional output per Lukenweld Roll. From then on the increased production was clear profit.

In its estimates the company used these costs:

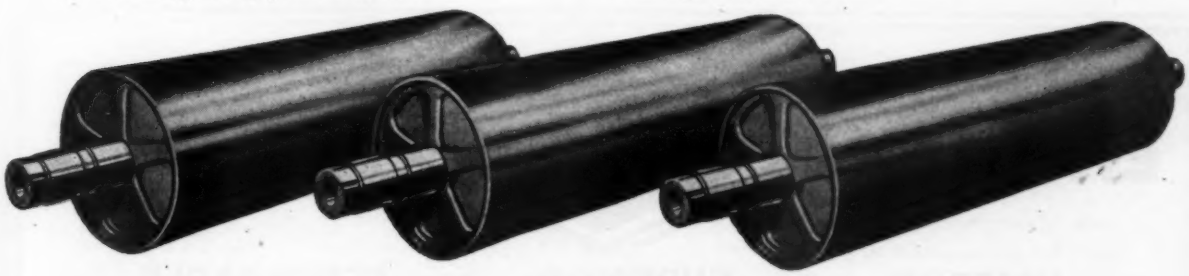
$40.00 = Raw Material Cost
+$25.00 = Operating Cost
$65.00 = Cost per Ton of Product

Based on a selling price of $85.00 per ton, there was an operating profit of $20.00.

Using the above formula based on all rolls operating at 50 psi steam pressure, the user showed that the Lukenweld Rolls paid for themselves in 268 days.

This company, however, is running its Lukenweld Rolls at 150 psi. Had the estimate been based on this higher pressure, with the resultant 48% additional output per Lukenweld Roll, it would have shown that the rolls had paid for themselves in 85 days.

For additional details, write to Lukenweld, Division of Lukens Steel Company, 408 Lukens Building, Coatesville, Pa.



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LUKENWELD
DRIER ROLLS AND DRYING MACHINERY

TABLE 1

	Bark Fuel	Coal Fuel
Steam—pounds per hour	85,400	100,000
Steam pressure—psi	550	550
Steam temperature—Fahr.	700	700
Feed temperature—Fahr.	210	210
Air temperature undergrate—Fahr.	275	280
Over-all efficiency—per cent	73.1	83.0
Fuel—pounds per hour	25,000	11,300
Fuel—pounds per sq. ft. per hour	106	48
Liberation—Btu per cu. ft. per hour	21,800	22,400

walls, economizer, air heater, dust collector, fans, and other required auxiliaries.

Each of the four furnace walls are water cooled, but the amount of cooling was limited to keep a hot furnace to help speed the combustion of the bark fuel and also to be sufficient for the coal fuel.

The main bark fuel and the alternate coal fuel are fed through the same bin and fuel spouts. The two fuels are not normally fed to the bin simultaneously, but it is possible to change from bark to coal burning without losing load or steam pressure.

There are two locations for feeding bark to the furnace; one is from the bin through the spouts and the four stoker feeders, and the other, from the coarse bark conveyor through spouts directly to the furnace. As the bark leaves the barking drums, it is hogged and transported by an inclined belt conveyor to a vibrating screen with 2-inch openings. The bark that passes through the screen falls upon a belt conveyor that discharges into the bark bin. The long "stringers" that pass over the screen fall upon another conveyor that discharges into the coarse bark feeding spouts directly to the furnace. The "stringers" are fed separately by gravity because if they are dropped into the bark bin, they are apt to interfere with the regular feeding of the fine bark even though the amount is small at any time and encountered only at certain seasons.

An efficient dust collector is important and is installed after the air heater. The solids, consisting of some partially burned fuel, ash, and sand carried over with the combustion gases, are separated and returned to the furnace for further burning and discharge to the ash pit on the traveling grate.

The unit was started in April, 1946, and has operated satisfactorily burning either bark or coal and at more than the design capacity of 85,400 pounds per hour on bark and 100,000 pounds per hour on coal.

Centralized Planning and Control of Plant Layouts

C. E. CASS
Central Plant Layout Supervisor
Marathon Corporation

It is quite generally recognized in industry today that the operating efficiency of a plant will be no better than the quality of its layout.

The organization for plant layout need not be complicated. In some companies the personnel may be limited to one man or in very small plants the function may be added to the responsibility of the plant engineer or his equivalent. The important consideration is that some one individual be given the responsibility of keeping the layout needs abreast with the company's policies and plans.

The function of the Plant Layout Department in brief is to place the right equipment in the proper place with the best method for manufacture or processing through the shortest distance in the lowest time. Specifically, the functions are:

1. Design and maintain plant layouts for all areas of manufacture or processing.
2. Prepare and maintain complete files of plant layout flow data for all manufacturing processes.
3. Analyze plant layouts and plant layout flow charts to realize: (1) the best combination of conditions for availability of supply outlets; (2) best accommodation for current and anticipated equipment and materials; (3) best working conditions.
4. Prepare machine layouts and preliminary building characteristics and dimensions for anticipated facility expansion.
5. Direct and approve layout changes proposed by management or operating personnel.

There are two major schools of thought on plant layouts. One advocates flat plane with templates; the other the more impressive three-dimensional employing models. Some of the latter go to extremes in models, incorporating exceedingly minute detail. We agree that three-dimensional layouts present the best picture of a machine line; however, they are costly to prepare, require a tremendous amount of time to fabricate and demand a large amount of floor space to display.

Our plant layout program provides for the preparation and maintenance of layouts of all floors of every building in a five plant operation. The magnitude of this program in itself excludes the possibility of three dimension layouts for use as masters. After a study of the problem we planned and adopted the following system:

All master layouts will be of the flat planetype using machine templates. Three-dimensional layouts with models will be used only for the solution of special problems where the proposed machine line cannot be illustrated in any other way.

Master layouts are prepared in sections on ½ inch plywood sheets, each of which is 30 x 48 inches in size. This affords direct reproduction of each section by means of the photostatic process. The master layouts remain in the Central Plant Layout Section and photostatic copies are furnished to the resident plants. All of the master layouts are contained in a single 4 x 11 foot floor cabinet which in four compartments accommodates sixty-two sections stored flat in guide slots. Each section is numbered to correspond with the index provided on the cabinet top. The top of the cabinet is at table height for display of layouts, four sections at a time, for study or discussion. The sections on display may be interchanged with those in the cabinet in a matter of seconds.

The master layouts are maintained on a

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Fig. 2228 Screw Ends
Fig. 2229 Flange Ends
Double Wedge Disc
Rising Stem

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Fig. 2230 Screw Ends
Fig. 2231 Flange Ends
Wedge Disc
Non-Rising Stem

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Fig. 2232 Screw Ends
Fig. 2233 Flange Ends
Wedge Disc
Rising Stem

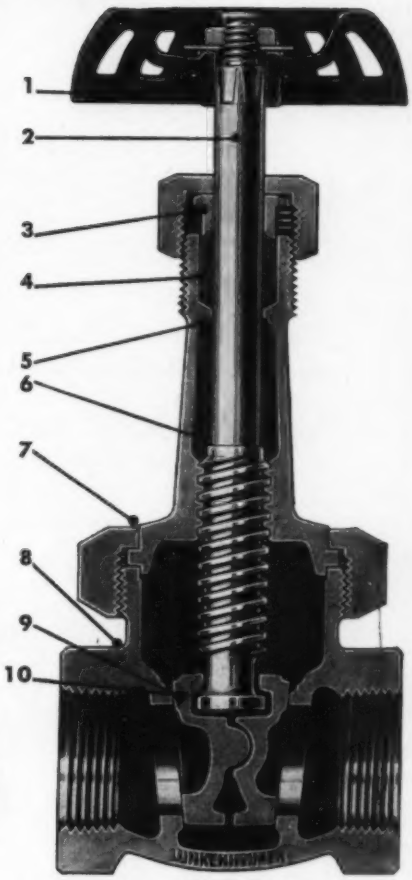

Fig.. 2228

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current basis at all times by a comparatively simple procedure:

Resident plants are provided with two forms which they use to: (1) request authority to make a major change in layout; (2) give notice of a minor change in layout. In each instance the form must be accompanied by a full description and a drawing or tracing showing the change. In the event of a major change, if authorized after analysis, the master layout is revised to conform and a new photostat is prepared which is sent to the resident plant with the approval. In the event of a minor change, the master layout is brought up to date and a new photostat is prepared and sent to the resident plant.

Should the layout change originate in the Central Layout Department, it is cleared with the resident plant before being executed, the master layout is revised and a new photostat prepared before the change is made.

In all instances a superseded photostat is destroyed upon receipt of a revised edition.

Where new machine lines or major changes in existing lines are contemplated, working layouts are employed. After approval, the working layout is transferred to a master.

Blank sheets of plywood are placed on the layout cabinet to form a work table. A white print of the manufacturing area is then stapled to the plywood top. Loose templates of the equipment to be employed in the line are next placed in position. The templates are shifted in position until the layout of maximum efficiency is achieved. We next cover the entire arrangement with sheet acetate which holds the templates in position. On the transparent sheet one may indicate conveyor lines, storage areas, transportation routes and flow lines. The working layout is used for discussion and study until officially adopted as final.

Considerable interest has been evidenced recently in the establishment of standard procedures for plant layout. We have adopted a set of standards for our own operations as follows:

1. The uniform scale shall be ⅛ inch equals one foot.

2. The background or surface of all layouts shall be 8 x 8 to the inch graph paper (this sets off all floor areas in square feet and provides a ready index of distances).

3. Plastic cord shall be used for the indication of building perimeters and partitions, work areas, storage areas, conveyor lines.

4. Plastic sheet material shall be used for templates to represent machines, movable equipment (tables, benches, scales, etc.), materials handling and/or storage equipment.

5. Building column lines shall be indicated by numbered (vertical lines) and lettered (lateral lines) index tacks. We have found an excellent means of representing railroad sidings by borrowing from the model railroaders. One-eighth inch black tie strips (H O scale) may be purchased in 100 foot rolls and may be applied to a layout board very quickly in any desired track formation.

To facilitate interpretation of plant layouts we have developed a standard color scheme for templates, boundary lines and materials handling equipment. Each color has a definite message which it conveys instantly to the observer. For example, flat plastic cord is used to indicate building perimeters and partitions. Black cord represents existing construction; yellow indicates future expansion. The same color code is applied to machine templates to distinguish between existing and future equipment. Varying colors of cords are used to indicate such elements as power and gravity conveyors, work space, storage areas of several types and aisle ways.

If a plant layout program similar to that herein described is adopted and well regulated, these benefits may be expected:

1. Reduced manufacturing costs through (1) straight line production flow without retrogression and within minimum distances and areas; (2) reduction in amount of work in process; (3) conservation of floor area; (4) improved handling methods; (5) elimination of unnecessary machine moves.

2. Realization of long range planning with assurance of conformity with the adopted pattern for expansion.

3. Improved employee relations as a result of more efficient operation, orderly surroundings and improved working conditions.

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Making Packings Last Longer

H. G. KOCH
Section Chief in Charge Packings
Johns-Manville Research Center

The behavior of a gasket between two flanges, or of a packing in the stuffing box of a pump, is rather complex from an engineering point of view. Practically speaking, however, there are only two basic conditions which must be fulfilled for satisfactory sealing; namely, (a) the packing material must be in the right place; (b) it must contact the mating equipment surface with a certain minimum unit pressure.

In order for a packing or gasket to fulfill its primary function of controlling the leakage of a fluid, the packing material must obviously be so arranged that it presents a complete barrier to the passage of the fluid. If this condition is not fulfilled, leaking will take place in one of two ways: (a) through the packing material itself, or (b) between the packing material and the mating equipment surfaces.

Leakage through the packing or gasket material is ordinarily not of sufficient magnitude to present any problem.

The more common path of leakage is found between the packing and the mating equipment surfaces. Any through-channel will obviously permit leakage in an amount determined by the dimensions of the passage, viscosity of the fluid, and pressure drop along the channel. The through-passage is usually the result of poor conformance between the packing and the equipment, either when first installed or after service begins. For example, if a flange is warped out of plane to a greater dimension than the average linear compression of the gasket material under maximum bolt load the "barrier" condition cannot be set up, and the flange joint will leak under the first application of pressure. Again, if a valve stem packing is installed on a stem having a slight taper, the packing may seal when the valve is nearly closed, but may leak heavily when the valve is opened wide because the diameter of the part of the stem then under the packing is less than that of the packing itself.

The ratio between the gasket unit pressure and the fluid pressure is usually termed the "contact pressure ratio," and the value of this ratio should exceed unity to insure sealing. The harder the gasket and the rougher the flange and gasket surfaces, the higher will be the contact pressure ratio necessary to prevent leakage.

It is not necessary that every portion of the contact area between the gasket and flange be subjected to a unit pressure higher than the fluid pressure, as long as the high-pressure area is so disposed that it forms a continuous band completely encircling the joint.

Figure 1 illustrates a typical carbon paper print showing the nonuniformity of pressure distribution on gaskets of the same material, tightened to the same bolt load, and using the same pair of flanges. The relatively poor distribution of pressure on the thinner gasket should be noted.

It thas been the writer's experience that most braided and impregnated packings have completed their useful life after they have been compressed to about 75 per cent of their original volume. By this time most of the impregnation has been lost, high packing pressures are necessary to maintain sealing, and much damage may be done to shafts and sleeves if the packings are not replaced.

All of the causes of packing leakage, namely plastic flow, wear, thermal contraction, etc., are accelerated by high operating temperatures. In order to hold stuffing box packing temperatures to a minimum, it is essential that some leakage of fluid be permitted. The importance of this point can hardly be overemphasized, since ample lubrication of the packing shaft interface by the fluid being sealed may reduce the coefficient of friction, and thus the generated heat, to as low as one-third of the dry value.

An approximate estimate of the severity of given pressure and velocity condition may be made by multiplying the fluid pressure in psi by the surface velocity in fpm. The resulting product, which we will term the "PV" product for brevity, is a measure of the generated heat if variations in friction coefficient are disregarded.

Slow moving hydraulic packings, valve stem packings and the like, operate at PV products which seldom exceed 2000, and the frictionally generated heat is not sufficient to damage the packing material

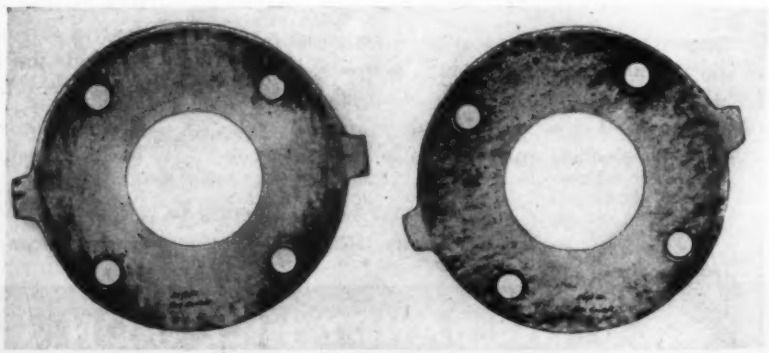

Fig. 1—Carbon paper print showing pressure distribution on 1/64 in. thick (left) and 1/16 in. thick (right) gaskets

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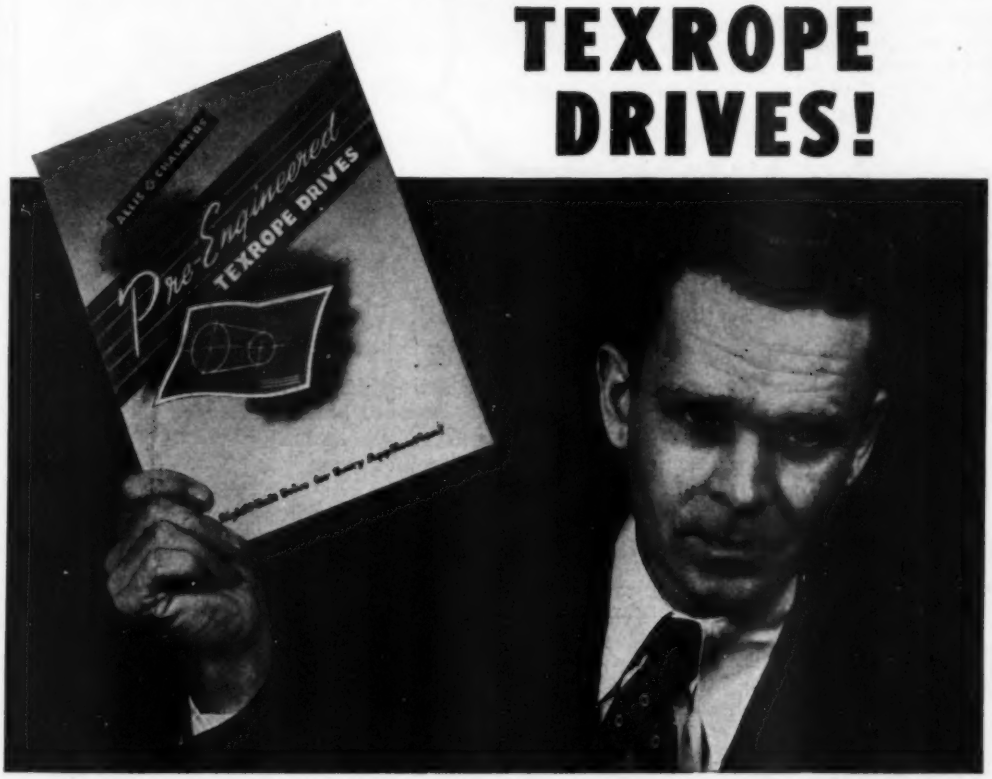

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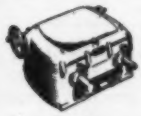

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even when no leakage occurs. In the range of PV values of 5000 to 10,000 the generation of heat becomes a problem with dry packings; i. e., those operated without leakage. The life of oil seals, for example, is quite short at PV = 10,000. Centrifugal pumps with small shafts may operate satisfactorily at a PV level of approximately 20,000 with leakage amounting only to a slow drip, and vegetable fiber packings such as ramie or flax have adequate temperature resistance for such service. Above PV = 50,000, this type of packing requires substantial leakage (of the order of 20 ccs or 700 drops per minute per inch of shaft diameter) and above PV = 100,000 the use of asbestos packings or the so-called "plastic packings" is preferred. The writer's experience with rotating rod testing in the 200,000 to 300,000 PV range indicates clearly that the extruded plastic coil packings will give considerably longer service than the braided asbestos types with lower leakage rates. However, at this relatively severe level of operation either type of packing will burn if the leakage is reduced below say 10 ccs per minute per inch of shaft diameter.

Let us summarize the specific points which should be followed if most economical and satisfactory packing service is to be obtained.

(a) In selecting packing for a specific service, follow the manufacturer's recommendations whenever possible. But remember that the manner in which the packing is installed, and subsequently handled, has the greatest influence on performance. A second-choice packing with first-rate handling will do better than a first-choice packing indifferently installed and carelessly serviced.

(b) After removing the packing from the container, place it on a piece of wrapping paper or newspaper, not on a dirty floor or bench top. Small chips of metal or other hard particles readily adhere to packings, and may do serious damage even to hardened shaft sleeves.

(c) Remove all packing from the box to be packed except in the case of an emergency repair, when shut-down time is at a premium and a few rings of packing must be added as a temporary measure. Clean shaft and box, and apply lubricating oil generously to all surfaces to assist the packing to seat uniformly.

(d) Check shaft or sleeve carefully for scoring or deep grooves. If packing performance has previously been poor, check for shaft run-out or sloppy bearing fit using an indicator. Poor mechanical condition should be corrected before proceeding if at all possible. If it is not possible to overhaul at the time of repacking, report the unsatisfactory condition immediately to the person responsible for scheduling repairs.

(e) Check whether the packing is of correct dimensions for the space to be packed. If the packing is too large to permit easy insertion after it is curved around the rod, roll the packing so as to reduce the radial dimension slightly. Use a piece of pipe or shafting for this purpose, and roll with uniform pressure, applying the pipe or shaft in the manner of a rolling pin.

(f) Cut the packing squarely to produce a butt joint. If the correct length is not known, determine it by curving a length of packing around the shaft (or around a piece of rod of the same diameter) and marking accurately across the back of the packing.

Use a very sharp knife. If the packing is of such construction that it tends to unravel or produce a ragged end, wrap a few turns of friction tape or Scotch tape snugly around the packing at the point to be cut, and remove after cutting.

(g) Curve the packing around the shaft, press it firmly against the shaft at the cut ends, and push the ring into the stuffing box, entering the cut ends first. Push the first rings home.

(h) The first ring must now be formed with as much care as if it were the only ring to be used. A pair of split sleeves made of pipe or hard wood are often used for this purpose. Alternatively a split steel seating ring may be turned up on a lathe to the same dimensions as the packing ring. Each half of the steel ring is then tapped with one or two blind holes on one face, so that studs of appropriate length may be screwed into the rings. The packing follower gland and nuts are then used to apply pressure through the studs and seating ring, and thus to the packing.

(i) Install the balance of the packing, successively forming each ring as was

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Fig. 1893—125-pound flanged end Gate Valve designed especially for Paper Mill Service. Body, bonnet and yoke are cast of 3% Nickel Iron; stem and screwed-in seat rings are of 18-8S Mo.; solid wedges are made of Ni-resist.

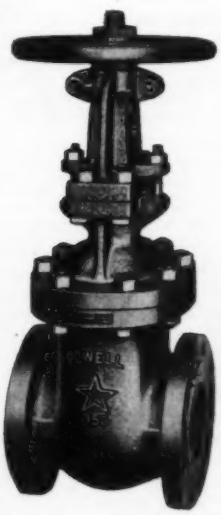

Fig. 1503 — Class 150-pound Cast Steel Gate Valve. Flanged ends, bolted flanged yoke, outside screw rising stem and taper wedge solid disc.

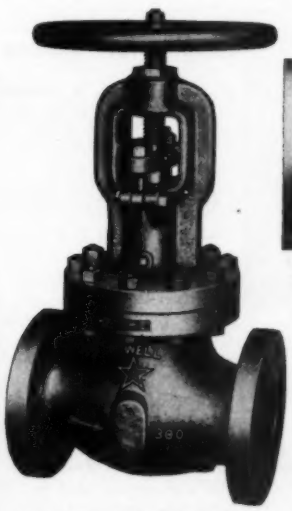

Fig. 3031—Class 300-pound Cast Steel Globe Valve. Has flanged ends, bolted flanged yoke and outside screw rising stem.

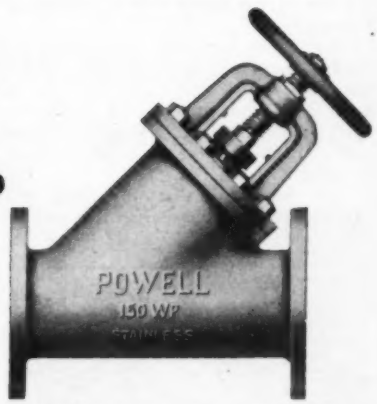

Fig. 1944—Large size 150-pound Stainless Steel "Y" Valve with flanged ends, bolted flanged yoke-bonnet and outside screw rising stem. Sizes 2½" to 12", inclusive.

Fig. 1708—200-pound Bronze Globe Valve with screwed ends, union bonnet, renewable, specially heat treated stainless steel seat and regrindable, renewable, wear-resisting "Powellium" nickel-bronze disc.

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done with the first ring. Stagger the joints so that each joint is located at about 180 deg. to the joints of the adjacent rings.

(j) If a lantern ring is used, install at the correct location. Check carefully to make sure that the fluid entry port will not be cut off as the result of a slight motion of the lantern ring into the stuffing box. In other words, the box should be filled with packing almost, but not quite, to the entry port, after which the lantern and remainder of the packing rings are added.

(k) Compress the last rings snugly using the follower gland. Slacken off the stud nuts, and bring them up within about 1/64 in. of the gland to allow for slight expansion of the packing at start. Finally, turn the unit over by hand to make sure that the packing is not excessively tight.

(l) Observe the packing performance closely during the first few hours of run-in, and allow it to leak more heavily during this period than the acceptable normal leakage rate. If necessary, slack back further on the gland nuts to encourage leakage.

(m) After the initial running in, the packing may be taken up slightly. After the first adjustment, do not adjust for at least fifteen minutes. If the leakage is then still higher than acceptable, readjust and allow to stabilize for another fifteen minutes.

(n) Remember that the lower the leakage is held, the shorter the packing life becomes, the more frequently the unit must be repacked, and the higher becomes the packing cost.

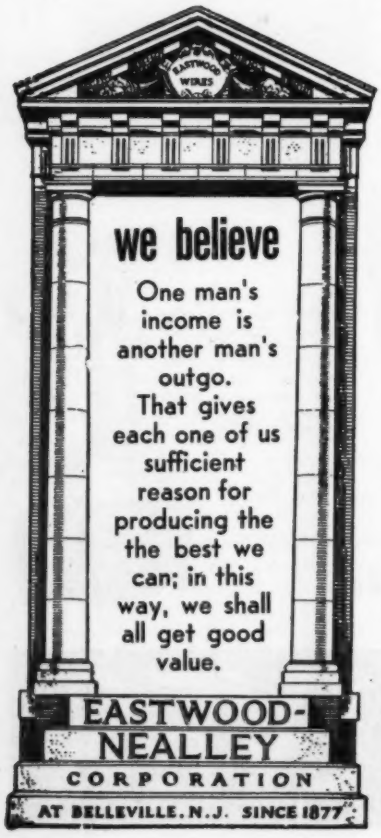
How to Handle Flange Gaskets

(a) Remove loose rust and scale from flange faces using wire brush.

(b) Apply graphite to gasket surfaces; brush off excess. The use of hard-setting gasket pastes for sealing is not recommended because of the difficulty of cleaning the flanges when repacking. If the gasket cannot be made to seal without the use of a paste, there is something wrong either with the flange, or with the gasket material. The use of a paste may be necessary, however, to hold the gasket in place while the joint is being assembled, in which case it should be applied to one side only.

(c) When tightening the bolts, work across the flange rather than around it. For example, on a six-bolt flange, tighten bolts No. 1, No. 4, No. 2, No. 5, No. 3, No. 6, and repeat until all are equally tight.

(d) Within a day or two after the joint has been made up, retighten the bolts in order to take care of the initial loss of sealing pressure due to cold flow. In the case of steam piping, do not apply insulation to the flanges in such a way as to interfere with this operation until it has been carried out.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Treatment of Surface Water Supplies for Pulp and Paper Mills

R. R. ADAMS
J. E. Sirrine Company

The proper treatment of a surface water supply, which is to be used in the manufacture of pulp and paper, is governed by a large number of factors, depending both on the character of the supply and the mill requirements. Some few mills are fortunate in having surface supplies which require practically no treatment, but others may and do require a complete treatment of the supply for the production of a satisfactory product.

Since the writer has been associated with several new projects in the southeast where the selection and treatment of the water supply was an important factor in the plant location, some observations in this connection may be of value to those who have an interest in this subject.

Rivers having their origin in the mountainous areas of the southeast are generally clear and have low turbidity during normal flow, until they reach cultivated and developed areas where soil erosion begins. Some of the mills can use this clear water without treatment; however, for the higher grades of paper, some form of treatment is usually provided. The water draining from the catchment area of the Blue Ridge Mountains, is as a rule very soft and low in total solids, except in areas where limestone formations occur. For instance, Pigeon River in western North Carolina, has a total hardness, according to an analysis made by the writer's firm of 1935, of 3 ppm, total solids of 36 ppm, and suspended solids of 7 ppm. This type of water is usually corrosive and sometimes contains objectionable quantities of manganese and iron. Special provision must be made at times in the water treatment plant to remove these objectionable elements.

River waters in the Piedmont areas of the southeast are generally high in turbidities, but have a relatively low dissolved solids content and upon clarification are low in color. Saluda River water with dissolved solids of 42 ppm, turbidity of 35 ppm and color of 35, was reduced to zero turbidity and zero color by coagulation and filtration in the laboratory.

A one year average of analysis of the Savannah River water at Clyo, Georgia by the U. S. Geological Survey, shows total solids 123 ppm, dissolved solids 41 ppm, total hardness 15 ppm, color 13, and suspended solids 82 ppm. Most of the raw river waters in the Piedmont area of the southeast will produce a very good quality of water for almost any type of pulp and paper manufacture, when coagulated and filtered in a modern treating plant, provided the source is not unduly polluted with industrial waste.

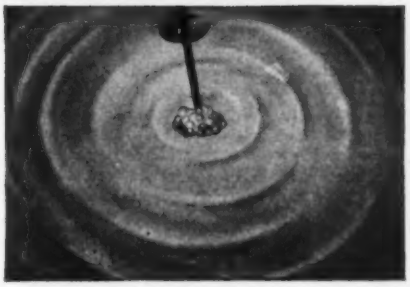
Rivers having their main drainage areas in the coastal plains of the southeast are generally low in turbidities and high in color. Suwanee River in Florida shows 6 ppm suspended solids and a color of 40. Ogeechee River near Savannah, Georgia, shows suspended solids of 6 ppm, dissolved solids 76 ppm, and a color of 28 ppm (1938). These low country waters usually are on the acid side and as a rule are high in iron, but generally are rather soft. Some of the rivers in the southeast, which drain from limestone areas, are comparatively hard. An analysis of water from James River at Lynchburg, Virginia, in 1937, showed 135 ppm total hardness. This type of river water is usually fed by springs from limestone formations. Lake waters do not provide a very prominent source of water supply for mills in the southeast, and will not be considered here, although the treatment in general will follow the methods used for purification of river waters.

The successive stages used in treatment of surface waters may be divided as follows:

1. Plain settling
2. Sterilization
3. Chemical feeding
4. Chemical mixing
5. Flocculation
6. Sedimentation
7. Filtration
8. *p*H correction
9. Clear water storage.

Plain settling is sometimes used where very turbid waters are encountered and the topography permits a low cost storage reservoir to be installed. Also, this type of treatment is obtained from impounding reservoirs and lakes where these form a part of the water supply system. The storage will produce some clarification and in addition will probably accomplish some color removal by the bleaching action of the sun. On the other hand, storage over a considerable period may promote the growth of algae and some forms of plant life, which will require remedial measures to provide a satisfactory effluent. In certain mountainous areas, plain settling may be the only treatment

STATISTICS THAT LOOK GOOD



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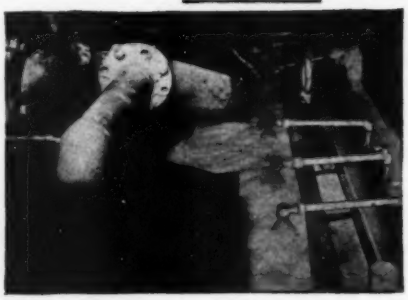
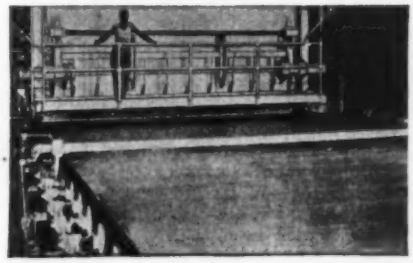
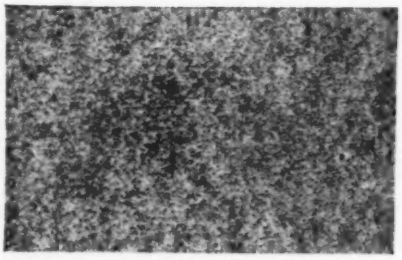


2 Minutes... that's how fast NOPCO KF drives foam from the head-box



5 Minutes... that's all NOPCO KF needs to clear bubbles from the wire



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required, except for pH correction and sterilization.

In recent years it has been found advantageous, at a number of plants, to sterilize by chlorination the raw water supply to the treatment plant before coagulation and sedimentation.

The complete satisfaction of chlorine demand by the raw water, with certain limiting qualifications, is called "Break-point" chlorination. In addition to killing the bacteria in the raw water, this type of chlorination also can be used to control the growth of algae, to aid coagulation, to oxidize manganese which is subsequently removed in the treatment process, and to reduce color by the bleaching action of this chlorine. The dosages required to accomplish "Break-point" chlorination will vary widely, depending on the character of the raw water. Unpolluted water with no ammonia, organic matter, hydrogen sulphide, or other reducing materials may require as little as one part per million or less, however, for highly polluted supplies the amount required may exceed 20 parts per million. Average river water demands will probably be around 5 ppm.

The next treatment used in surface water purification plants is some form of coagulation with chemicals. Although ferrous or ferric salts are sometimes used as a coagulant, the one most generally used is alum which is supplied in both liquid and solid forms. For normal river conditions in the Piedmont areas in the southeast, there is sufficient alkalinity in the water to produce a suitable "floc" with alum alone, so that no alkali is generally needed for flocculation. However, when turbidities rise above normal, it usually becomes necessary to add an alkali to combine with the larger quantities of alum required for proper flocculation. Lime, soda ash, and sometimes caustic soda are used as an alkali for this purpose.

To give some idea of the quantities of alum used in flocculating turbid waters in the southeast, it is good operation when a plant averages less than one grain per gallon of water treated. Turbidities of around 200 ppm will probably require around two grains per gallon, and correspondingly higher as turbidities rise, although the rate of increased alum required drops off as the turbidity goes up. For instance, a turbidity of about 1000 ppm will probably require less than 3 grains per gallon of alum. This applies only to turbidity removal. For highly colored waters with low turbidity, it is usually necessary to go to a comparatively low pH to secure a satisfactory "floc." It is generally found that more coagulant is required for removal of color from river waters than for the removal of a normal amount of turbidity. There are a number of coagulation agents, other than alum, which have special, and some fairly general, applications, however, alum is used most extensively. This alum, by the way, is the same as that used by paper makers, and a common storage system can be used when the water treating plant is close by the paper mill.

The equipment used for feeding chemicals will vary, depending on the physical form of the chemicals applied; for powdered dry materials several types of dry feed machines are available. The most accurate type will feed the chemicals on a weight basis; however, for small plants and small chemical feeds a volumetric type has been widely used.

After adding the coagulant to the raw water, it is desirable to disperse this material rapidly throughout the mass of water before flocculation begins. Flash mixers of various types are used for this purpose in modern plants. It usually takes several minutes before a "floc" begins to form, after the addition of the alum or other coagulant, and violent agitation during this period is not objectionable.

After this flash mixing operation, it is necessary to prevent excessive agitation in conduits leading to the flocculating basins. Usually velocities are limited to two feet per second in those conduits.

The next succeeding operation in the conventional type of plant is the building up of a "floc" by a gentle stirring action which tends to agglomerate the suspended matter into coarse particles which will settle rapidly in the sedimentation basin. It is desirable to obtain a "floc" which will collect all fine suspended matter and colloidal particles and leave the water between clear and sparkling.

Two general types of flocculation equipment are used. One is based on using stationary baffles, either over-and-under, or sidewise flow; with the agitation being obtained by controlling the velocity and direction of flow through the baffle system. The other is to provide a stirring action by means of motor driven paddles or other mechanical devices.

With mechanical flocculation equipment, one of the principal items to consider is the avoidance of short circuiting of unflocculated water into the sedimentation basin. To avoid this short circuiting, mechanical flocculation is sometimes carried out in several stages. One of the advantages of the mechanical flocculation over baffle flocculation is the small loss in head through the system. The baffle system is rigid and not subject to control with varying raw water conditions and rates of flow throughout the plant; whereas, the mechanical flocculator can be varied in speed to suit treating requirements.

After flocculation, the water enters the sedimentation basin, usually through some form of stilling device to distribute the flow across the width of the settling basin. There are several types of settling basins in use, probably the most prevalent being the rectangular concrete basin varying in depth from perhaps around 8 to 20 feet. The principal considerations in the design of the sedimentation basin is the period of retention, the inlet and outlet structures, and provision for the removal of sludge, either continuous or periodic. In rectangular basins it is desirable to have the flow of the incoming water spread out across the full width of the basin and maintained that way throughout its length.

Circular shaped basins are also used for sedimentation, particularly in plants using an accelerated type of treatment in which the raw water, mixed with chemicals, is agitated with previously formed sludge blanket to produce a rapid settling "floc." These have much less detention time than for the more conventional type of settling basin, although the mechanical equipment required is increased. The design criteria for this type of basin is usually the rate of rise of the water over the area of the settling basin rather than the detention time. The detention period is of the order of one hour. In this type basin the sludge is generally drained off continuously.

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the turbidity of the water should be reduced to less than 5 ppm. and sometimes is down to less than 1 ppm. For some mill purposes the quality of water directly from the settling basin is suitable. About the only practical means, however, of determining whether the mill can produce a satisfactory product by using settled water only, in the writer's opinion, is to make trial runs using only settled water. This is not always feasible, particularly in considering the needs of a new mill where no treating plant or paper mill exists. Usually, however, for new plants, it is known beforehand what quality of water will be needed and the necessary treatment can be determined by making tests on the raw water available. In any event, it is the writer's opinion that it is advisable, when filters are omitted from the treatment plant, to provide space in a plant layout for the addition of filters, except for low grades of pulp and board production, when it is certain that a high quality of water supply will never be needed.

The subject of filters has been much written about and fully covered in many excellent papers and books on the subject. A brief description may, however, be in order.

The filtering material generally utilized in rapid sand filters is sand or crushed graded anthracite coal in beds varying from about 24 to 30 in. in thickness. Sand of about 0.45 mm. effective size or anthracite of about 0.62 mm. are usually used, although these sizes are varied in practice to suit local circumstances and the ideas of the designing engineer.

The rate of filtration through sand beds is sometimes limited by public health authorities to two gpm per square foot of filter area when the water is used for drinking purposes; however, the tendency recently has been to increase this rate somewhat, particularly where adequate preparation of the water before filtration has been caried out. For paper mill process water only, there is no such limitation and rates of 2.5 to 3.0 gpm per square foot are not unusual. An important consideration in this connection is to keep the filter beds uniform and clean at all times and not allow them to deteriorate through lack of maintenance and proper operation. Adequate volume of backwash water should be provided at a suitable head, either from an elevated storage tank or by means of a pump taking suction from the clear well. Backwash rates should be controlled by filter bed expansion to get good washing and cleaning of the filter bed down to the gravel at each backwash. This method, using filter bed expansion, automatically takes care of the variation in backwashing efficiencies with changes in the water temperature. Wash water rates may be as much as fifty per cent greater in summertime than in winter for the same bed expansion. Sand expansion indicators are available from filter equipment manufacturers.

After filtration, the water is usually given an after treatment with lime, soda ash, or sodium hydroxide, to bring the pH to the desired point. Also means for post-chlorination are usually installed and used, except where pre-chlorination is sufficient to carry a chlorine residual into the clear well.

No mention has been made in the foregoing of the use of several aids in water treatment, such as activated carbon for odor and taste control, activated silica as a coagulant aid, sodium aluminate and other coagulants, all of which have applications for treating certain types of waters. Extensive data on these and similar materials are available from the manufacturers and suppliers of these materials.

Considerations Involved in Control of Paper Mill Slime*

F. S. McCALL[1] and R. T. HUDSON[2]

The results of investigations concerned with slime control which have been carried on for the past several years at the Savannah plant of the Union Bag and Paper Corporation have served to emphasize the seriousness of slime from an economic standpoint.

In some mills the effects of slime on machine operation and on quality of product are so great that relatively expensive control measures are practiced without question as to the costs involved. However, in a sustained slime control program it is essential to know what economic benefits can be obtained by maintaining a given level of control. Without this knowledge there is the possibility of allowing costs of corrective measures to exceed the benefits received. On the other hand, if the real cost of slime troubles were known, more extensive means to effect control might be warranted.

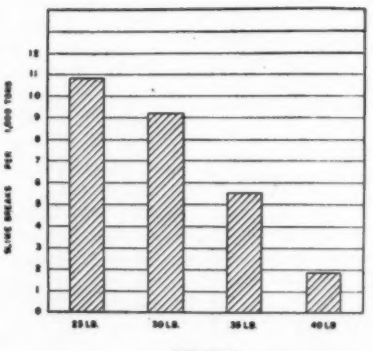

Fig. 4—Slime breaks per 1,000 tons kraft paper—comparison by basis weights

In attempting to justify the cost of slime control measures, it is desirable to bear in mind some of the less obvious effects of slime, the costs of which are indeterminate but appreciable. Some of these factors as well as the more obvious ones to be considered in a complete survey are:

1. Lost time at the paper machines due to breaks and cleanups directly caused by slime.
2. Reduction of machine speed to minimize slime breaks.
3. Impairment to the life or performance of felts and wires.
4. Losses of fiber and water due to purging the system because of slime and dirt accumulations.
5. Inferior quality of product.
6. Fouling and corrosion of pipe lines and equipment.
7. Conversion troubles.

In most mills adequate records are kept

(*) Abridged from paper read before the Technical Association of the Pulp and Paper Industry at its fall meeting held in Asheville, N. C., Oct. 9-11, 1947.

(1) Assistant Superintendent, Mill Technical Department, Union Bag and Paper Corporation; (2) Assistant Paper Mill Superintendent, Union Bag and Paper Corporation.

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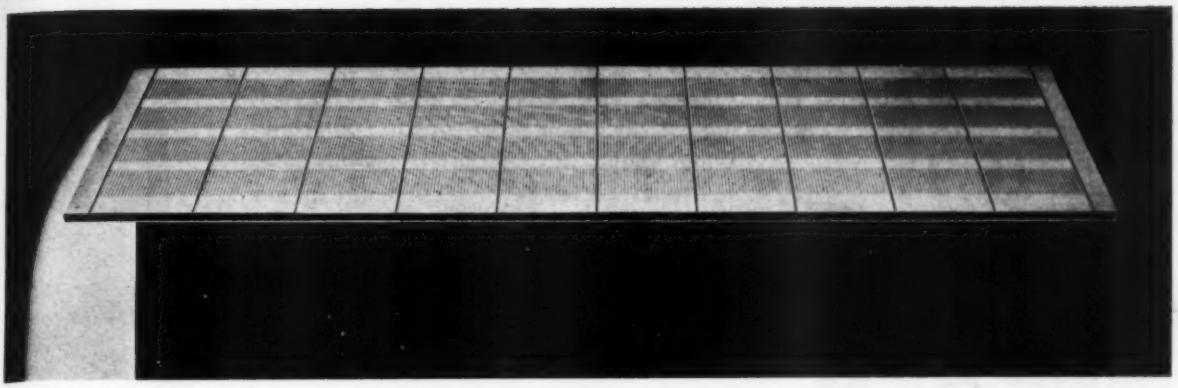

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of lost time at the machines which can be utilized in evaluating at least a part of the total trouble caused by slime. In our case, the total lost time figure is classified into three main categories, namely, mechanical failures, electrical failures, and breaks which are independent of the first two causes. The time lost, time of occurrence, and position on the machine are recorded. This report also includes the machine operators' explanation of the probable cause for the break. Obviously, it is difficult to ascertain definitely the cause of some machine breaks, so we examine the break tails to help determine the true cause.

In analyzing our machine lost time data we have observed a relationship between the speed of the machine and wet end brakes and a relationship between the weight of paper being made and slime breaks (Figure 4). In the first case, there appears to be a definite indication that as the speed of the machine increases, the number of breaks also increases. Our data show consistently that about one out of every five wet end breaks, not caused by mechanical or electrical failure, is caused by slime. It is quite obvious then, that the effect of slime on production can be quite serious when it becomes necessary to reduce speed because of excessive breaks. In the second relationship the results show very clearly that the greatest number of slime breaks occur when producing the lighter weight papers. The grades of paper compared were 25 lb., 30 lb., 35 lb., and 40 lb. kraft bag papers. On the basis of the number of slime breaks per 1000 tons of product, the amount of breaks for 25 lb. paper was about five times the number for 40 lb. paper.

It is generally accepted by many of those who have studied the growth of microorganisms in pulp and paper mills that effective control can be obtained only by including efficient manual clean-ups in the over-all slime control program.

Starting about the first of this year, we began an extensive general mill clean-up program, which, although not complete, has shown definite benefits as indicated by a substantial reduction in machine lost time. Some of the various phases of this program are as follows:

A. Mechanical Changes to Paper Machines

1. Replace the following equipment at each machine with stainless steel: piping to pump suctions at chests and pits, save-all pans and supports, downspouts, table tie rods, bolts, etc.

2. Install quick opening caps at the two machines having semiclosed headboxes so that boxes can be washed out thoroughly.

3. Redesign flatbox downlegs to eliminate offsets, and replace with stainless steel.

4. Redesign flatbox outlet connections so that they connect to a stainless steel box with a quick opening door to facilitate cleaning of the downlegs.

5. Line all chests and pits with tile. Although this part of the program has not moved very far, one of the machine sealpits has been lined. The indications are that lime growths at this point have been materially reduced.

6. Redesign flatbox sealpit to allow for the continuous removal of floating foam.

B. Wash-Ups

1. On each general mill shutdown two complete systems are flushed out with hot caustic solution. This is accomplished by filling the stock chests with water, adding caustic soda at a concentration of 2#/100 gallons, and steaming the solution in the chest to a temperature of 140 Fahr. The solution is then circulated through all stock and white water lines, head boxes, sealpits, beaters, and wirepits. The program is set up to completely flush each of four systems twice a year. In addition to the systems which receives the complete treatment, all save-all and decker sealpits are thoroughly cleaned and treated with caustic solution on every shutdown whenever possible. Also, all rectifying rolls are pulled out of the head boxes and the boxes are scraped and cleaned thoroughly.

2. On wire changes, the wirepit and headbox are flushed out with caustic solution. The mechanics of this work are such that wire changing time is not prolonged. As soon as the machine goes down, the headbox and pits are emptied and the wire crew hoses the tables and boxes while the machine is being stripped. The pits are then refilled with fresh water

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and caustic soda, at 2 lb. caustic per 100 gallons, and steam is applied until a temperature of 140 Fahr, is reached. The fan pump is then started and the solution is circulated through the headbox. This flushing is usually completed by the time the wire poles are ready to be placed in position.

The value of bacterial counts as a control measure is questionable so far as our experience is concerned. Such tests undoubtedly are useful in investigational work to determine the sources of contamination. However, so far we have been unable to correlate bacterial counts on samples from various points in the white water system with either observed conditions of slime growths or other test measures. In addition, bacterial counts are complicated to carry out and are time consuming.

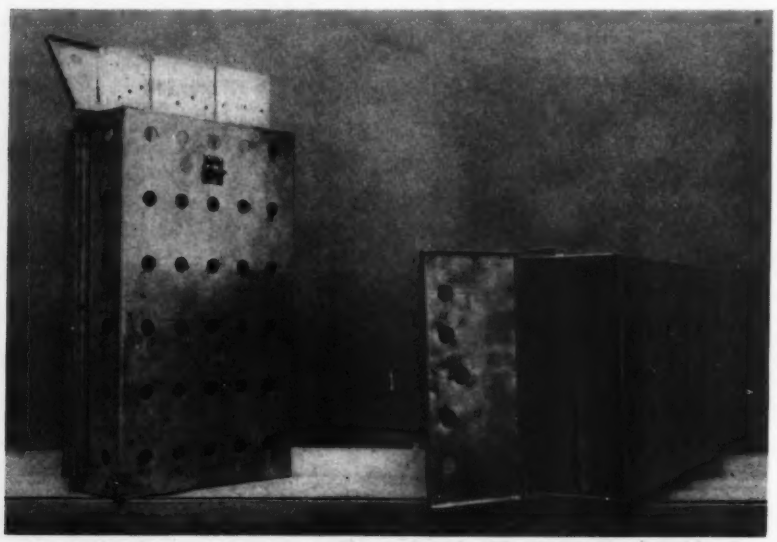

Fig. 5—Test board assembly for determining the rate of slime accumulation

One means of measuring the effect of slime control treatment is to measure quantitatively the rate of slime accumulations. About two years ago we began developing a procedure for making these measurements. Several revisions have been made in the interim. In our present procedure, a pine board about 1 ft. by 2½ ft., protected by a perforated stainless steel cage, is submerged in white water at strategic points in the system under investigation (Figure 5). At intervals of 24 hours, the slime accumulation on a specific area of the board is scraped off, after draining, into a tared container and the wet weight is recorded. Thus, a definite figure for the rate of slime accumulation is obtained, and is reported as the weight in grams per square foot per day. Our experience has indicated that a prime requisite in conducting this test is to be specific in regard to the time interval, area scraped, type of panel, and position of the assembly. We have been able to correlate test board data with various toxicant treatments. On the other hand, we have been unable to correlate such data with the number of breaks at the machines. This is not surprising in view of the fact that the test does not take into account the character of slime, the frequency and effectiveness of clean-ups, as well as other factors which affect breaks at the machine.

Other tests which may be useful in selecting a toxicant treatment and determining its effectiveness are suggested in some of the fundamental laboratory studies on slime producing microorganisms. These involve methods of identifying the various microflora present and means for determining residual concentrations of toxicants. While these methods may be helpful in preliminary stages of slime control work, it would appear that they are too time-consuming and complicated for general application.

The following abridgments are from papers presented at the annual meeting of the Technical Section of the Canadian Pulp and Paper Association, held in Montreal, Quebec, January 29, 31, 1947.

What Constitutes the Desirable Sulphite Mill?

L. C. KELLEY, General Supt.
British Columbia Pulp & Paper Co., Ltd.

During the past year the sulphite committee of the Technical Section worked out and circularized a questionnaire, the basic purpose of which was to determine what equipment and operating practices were the best for the ideal (later changed to "desirable") bleached sulphite paper mill. The consensus of the opinions expressed in the answers received to the questionnaire was to be determined by the committee, and it was felt that a very worth-while contribution could thus be made to the sulphite industry as a whole.

The committee could not, from the answers to its questionnaire, draw up a sort of set of blueprints for a "standard model" sulphite mill to come off a production line. It was felt, however, that a paper on the subject might prove of interest and would at least serve the purpose of starting constructive argument. Hence these notes on the "desirable" sulphite mill equipment and operating practice. It is understood that this paper gives the views of the writer only, and does not necessarily represent those of the sulphite committee as a whole.

Location of Plant

One could cite many reasons why our desirable sulphite mill in Canada should properly be built on the Pacific Coast. These include such things as the climate, which, being mild, allows initially cheaper mill construction from not having to build for insulation against the winter cold of eastern regions; lower operating steam costs due to lack of such heating load; no capital tied up in a woodpile to last out the winter months; lower wood operating costs due to lack of continuous building up and taking down of the woodpile; wood species that have a longer fiber length and a higher alpha than eastern woods, that hence result in a better pulp, etc.

Thus, while our first recommendation is that our mill be on the Pacific Coast, such a recommendation is not of much use to companies whose timber holdings are elsewhere. In any case, regardless of desirability, the timber holdings of our companies will determine the location of our mills and the type of wood species from which we must make the sulphite.

Wood Cleaning

Having our wood supply, whatever it is, we should clean it thoroughly from bark and dirt if our end product is to be a clean sulphite. Without clean chips, it is next to impossible to make clean sulphite, and it is far cheaper in the long run to install wood-cleaning equipment than it is to install screening or other stock-cleaning systems to try to remove the dirt from the pulp later on in the system.

The modern trend and the method we recommend is hydraulic barking.

The desirable sulphite mill on the west coast will have whole log chipping after hydraulic barking, followed by chip screening and adequate chip storage. By "adequate" is meant at least enough for two days' cooks to take care of the forty-hour week. Hydraulic barking and whole log chipping result in some increase in the dirt count in inbleached pulp and a slight lowering of strength values in the pulp. The reasons for these are obvious. With a good screen room, the mill producing bleached sulphite will hardly notice the dirt increase, and it does not show at all in the dissolving pulp.

With hydraulic barking the rossers should be eliminated in the eastern mills, thus effecting an appreciable saving in man-power and wood.

As regards chip size and type of chip

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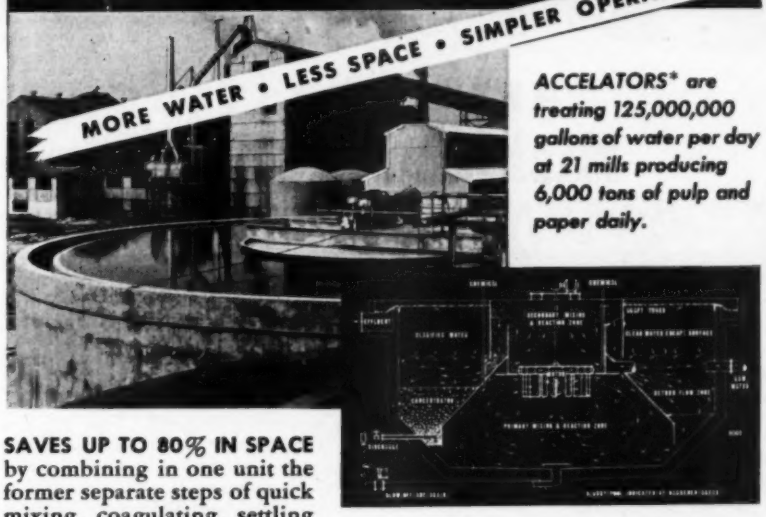

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screens used, the writer does not think this is relatively very important. A chip screen of any make does not use much power and merely removes the too big pieces of wood and the sawdust. Some do it more efficiently than others but, if you have chip screen capacity enough in your plant now, you will have a hard time proving the economics of changing them. A new plant being built is well advised to investigate the new model chip screens and install them in preference to the old type, slow shaker screens. A new screen has been patented, which claims to remove all loose bark from chips. It is not in production yet, but if it does what it is claimed to do it may revolutionize chip screening and result in much cleaner finished pulp.

Chip size, within reasonable limits (¼ in. to ⅞ in.) is unimportant as regards pulp quality, provided the size is uniform. The smaller the chip the longer it takes to make them and the more power used per ton of product, and vice versa. Uniformity of chip size cannot be too strongly stressed, and this in turn means keeping chippers in shape. Knives and steels are being manufactured now that make this possible and give performance impossible a few years ago.

The eastern mills would be well advised to adopt the western practice of chip storage bins or silos at ground level. It makes for less expensive digester house construction, eliminates the drip on the cooking floor, and allows uniform, controlled filling of digesters.

Acid Making

Here again it is impossible to standardize for all our mills. That cooking acid is correct which results in the pulp qualities desired for that mill. Thus, the acid for a satisfactory unbleached for newsprint as an end product in one mill might be completely unsatisfactory to produce an unbleached for high alpha acetate pulp as an end product in another. The desirable acid plant is that which will produce the quantity and quality of acid required in the individual pulp mill at the lowest possible cost.

We could, however, give specifications for our "desirable" all-purpose acid plant as follows:

A spray type burner such as the Texas Gulf in line with the sulphur burning practices in the sulphuric acid industry.

A melter for the sulphur at ground or other accessible level and not over the burner.

A boiler between burner and cooler to produce the steam for the melter and some process steam in addition. It is thus possible to obtain approximately two pounds of steam for each pound of sulphur burned. This is well worth while recovering.

Cool the effluent gas from the boiler flue by direct water screen to 105-110 C.

Conventional Jennsen gas fan and limerock towers, using one set of two towers up to 200 tons of finished pulp per day, a three tower system from 200 to 300, and a four tower system over 300 and up to 500.

A pressure tower to build up the free to the desired strength.

Adequate acid storage tanks, preferably concrete, tile-lined.

A low pressure (up to six to seven pounds) tank as exemplified by the Stebbins pre-stressed concrete pressure tank, into which goes the raw tower acid, and low pressure digester and accumulator relief.

Acid filters if limerock, high in per cent insoluble and organic, is all that is available.

A make-up-water cooling or refrigeration system to control combined.

The cleanest limerock available with the highest possible calcium carbonate content.

Acid-resisting steel pumps to handle the acid, and hard lead piping for ordinary temperature acid and gas lines.

Instrumentation should include temperature control for the melting tank, pyrometer, SO_2 recorder, spray water curtain control by temperature of the effluent gas, vacuum and pressure gauges.

Digester House

Our "desirable" sulphite mill will have basically enough digester capacity to allow a reasonable length of cook; the digesters will have forced circulation and indirect heating; the circulation will be from the bottom to the top; we will chip pack with steam, have "automatic" or instrument-cooking control, have hot acid accumulators, and will be able to produce high enough per cent free and low enough per cent combined to make the type of unbleached pulp required.

It is, of course, unnecessary to point out that acid-resisting steel should be used for hot acid pumps, piping, digester sleeves and fittings, valves, blow valves, etc., and that the digester charge should be standardized by the chip weightometer. Such things are common knowledge, but one should stress that too unnecessarily wide variations in sulphur, wood, and steam per ton exist in our sulphite mills.

Before we leave the digester house, perhaps a word would be in order on dumped pulp vs. blown pulp. The former gives a pulp with a higher tear than blown pulp, makes unbleached pulp that cannot be screened on flat screens, and uses up one hour and forty-five minutes per cook in draining and washing. The resultant pulp has no outstanding features that would justify the time loss, yet on the other hand, with a proper rotary screen room to handle the pulp, it has no qualities inferior to blown pulp, nevertheless, we would not recommend dumped pulp as a necessity in our "desirable" sulphite mill.

One mill scale conversion is under way, using magnesium base acid. It will be a year at least before any authoritative mill scale data can be given on the economics of this system. Likewise, one mill has gone over to ammonia base liquor. Both of these installations were caused primarily by the urge to overcome a purely local mill problem, and were not necessarily done with the object of revolutionizing sulphite quality and cost performance.

Blow Pits

Digester blow practice varies from having each digester blow into its own pit to having several digesters blow into one. We prefer the former and prefer to treat each cook by itself throughout the following system according to its tests and to mix finished treated pulp at the end before the drying machines.

Round wooden blow pits with acid-resisting steel bottoms have less upkeep than the wood-lined concrete rectangular pits, so our mill will have the former.

We will recover SO_2 and heat from the vomit gases to cut down sulphur per ton. With good digester practice, up to thirty pounds of sulphur per ton of pulp can be reclaimed from the vomit gases. The simplest way to recover it is to use sprays in the vomit stack when the digester is blowing, collect the water into a tank and use this water for acid plant make-up. Much more elaborate systems could be installed to recover both heat and SO_2, but it is questionable whether or not the expense is justified.

We recommend that a connection be made from under each blow pit bottom to a common header, thence to a pump to circulate back at the start of a blow the first wash water that goes through the acid-resisting steel bottom. This will save more than enough fiber to warrant the expense of installation.

Each individual digester blow pit should be large enough to hold two cooks in case of emergency.

Perhaps mention should be made here that we should leave room in our building for possible future reclamation of blow pit waste liquor. So far it has not been found possible to evaporate calcium base liquor successfully on a plant scale, but, should it be accomplished in the future, we should be prepared to take advantage of the savings possible. In brief, the stock then will not be washed in the blow pits but on a battery of washers using the counter current principle. The weak liquor from the last washers will be used to flush the stock out of the pits, which will then have solid bottoms, and the strong liquor from the first washers sent to the evaporators. The steam recovery and economics of the process should then be roughly the same as is regular practice in the sulphate mills.

Unbleached Screen Room

The washed stock from the blow pits should preferably be thickened over washers and sent at a constant consistency to a surge tank before the knotters. A further consistency regulator should be put between the surge tank and knotters to feed the screens at controlled consistency. This will allow the screens to operate at best efficiency. For knotters we will use Jonsson knotters with ¼ in. holes.

Our "desirable" mill will have flat screens rather than rotaries, because the former give cleaner pulp. If the stock is well washed, and no bleach-type or acid-type slime remover added, then chromium plated plates, Style E, 8 slots per inch, are satisfactory and will prove cheaper than bronze in the long run. Personally we prefer the acid-resisting steel plates, which,

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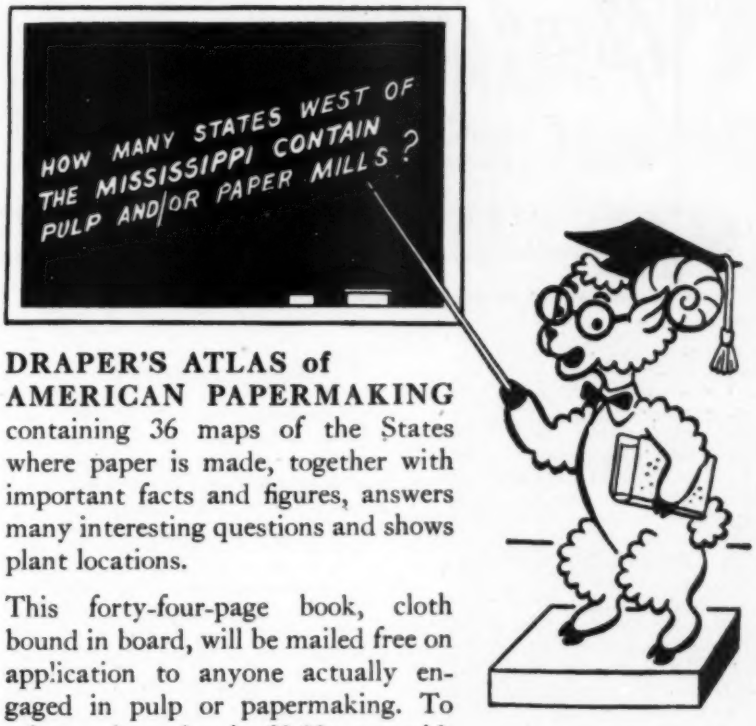

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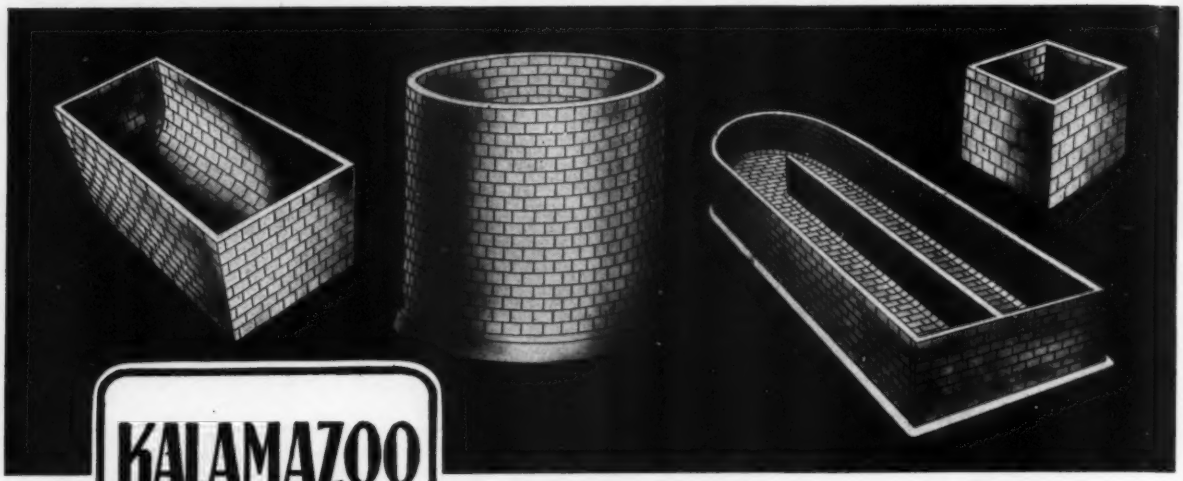

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though very expensive initially, are the cheapest in the end. Furthermore, we prefer Union screen plate fasteners to any other type.

Unbleached screens should not have more than 48 plates per line, and preferably not more than 36. The overflow from flooded primary screens should flow by gravity over secondary screens and these by gravity over the tailings screen. This to cut down operating maintenance costs and to make cleaner pulp.

The intake to each screen should be so designed that the stock flows evenly on the screens, with minimum velocity and no turbulence. Dilution water should be between the screens and enter from underneath the stock flow and not from above and enter at low velocity to remove any turbulence. Most screens manufactured have too small an outlet stock area and the wrong-type seal and these vitally affect screening capacity. Our "desirable" sulphite mill will have all these points correct.

The knotter rejects and screen tailings should be recovered and refined and saved on a wet machine as a daily check on screenings losses. We recommend this even though our balance sheet might show a net dollar loss from the sale of the screenings over their manufacturing cost.

Bleach Plant

The bleach plant of the "desirable" sulphite mill must produce a variety of sulphite grades and hence must be flexible and versatile. Therefore, it should have in it the necessary equipment and stages to make it so. Basically, it should consist of a chlorination stage, an alkali soaking stage, an intermediate hypochlorite stage, a final hypochlorite stage, thorough washing between stages, and means to control *p*H on the outgoing stock to the machines.

The chlorination stage must be at low density (3-4%) and in the cold, but it is immaterial whether it is batch or continuous. The space available and the amount of unbleached storage will probably be the deciding factors rather than any proven superiority of one method over the other. The writer prefers batch chlorination because, for obvious reasons, even with the best of care, unbleached sulphite will vary, and with batch chlorination it is possible to chlorinate each charge according to its chlorine demand. However, since chlorination is done primarily to get rid of as much lignin as possible in the cheapest possible way, and since chlorination at low density in the cold does not injure the fiber, it really makes very little difference to quality if the stock is over chlorinated or underchlorinated. If the former, it will temporarily smell up the bleach plant with chlorine until the ventilation system removes it. If the latter, it will only mean a slightly higher cost for hypochlorite bleaching later on in the system to make up the difference.

Tests for chlorination include viscosity, consistency and bleachability. The full possible amount of chlorine that can be absorbed as elemental chlorine should be used.

Washing after chlorination should be done acid. This necessitates a rubber-covered, acid-resisting steel clothed washer.

For the alkali neutralization stage, caustic soda is the usual chemical used. Milk of lime can be used but it is messy and undesirable, although cheaper than the caustic soda. It should be added to the cake on the discharge side of the above washer and the stock is preferably fed to this stage from the washer in double screw conveyor mixers to get the caustic well mixed with the pulp.

The white water from the washer after the caustic soak can be used for vat dilution in the preceding acid washer. This caustic washer must give a really thorough washing.

In the first hypochlorite stage following the caustic washer, bleaching should be done at not over 75 Fahr. and at controlled *p*H, and the amount of hypochlorite added is preferably that which will leave a predetermined constant low bleach demand in the last stage. Again the process can be batch or continuous, but again for cost reasons should be at high density. Without going too far into too many reasons, while, as stated, this stage can be continuous, it is far better to have it batch.

Thorough washing should be done after this first hypochlorite stage, and the white water should be sent to the sewer.

For the last stage most people prefer low density bellmers. The writer prefers medium density (10-12%) cells or bleaching engines. Actually, the preference for bellmers is a result of prejudice against high density bleaching from rather disastrous results obtained with it when it first came on the market. Today using a high density cell at only medium high consis-

tency allows much more flexible control than a bellmer and will do the job at less cost in the steam.

Too much importance cannot be placed on controlling hypochlorite bleaching *p*H, particularly in the last stage, if the whitest, strongest, and cleanest pulps are to be produced.

Thorough washing of the pulp must be had after last stage hypochlorite bleaching. The white water can be used on any of the preceding washers, preferably the washer before this last stage. If the pulp is properly bleached and properly washed, it is unnecessary to throw the *p*H of the pulp over on the acid side to prevent color reversal. Doing so, however, can do no harm and will result in a lower ash in the finished pulp.

All stock valves, pumps, washers, etc., etc., in our "desirable" bleach plant should be operated by electrical push button control from the operating floor. With this an operator and helper per shift can run the complete bleach plant for a 250 to 300 ton per day unit.

Bleached Screen Room

Having been properly bleached, the stock in our "desirable" sulphite mill will then go through a bleached screen room. This will have the same general lay-out as the unbleached screen room, and the number and slot size of the plates will be determined by the grade of sulphite produced and the market in which it is sold. Thus it is possible to use .006 in. plates on the tailings for high grade bond paper pulp, whereas on high alpha pulp nothing will go through a .006 in. plate at all. For ordinary sulphite paper pulps the coarsest screen that need be used in the primaries is .008, the intermediate can be .007 and the tailings .006. Personally, we prefer such a bleached screening set-up, i.e., sufficient fine cut plates to screen all the tonnage, rather than depend on the unbleached screen room to take out all the dirt and have merely a couple of lines of coarse-cut bleached screens to catch any large pieces of extraneous matter which might have dropped into the system after the unbleached screens. With well washed stock, chromium plated plates, Style E, eight slots per inch, will stand up for years. If hydrochloric acid is to be added to the pulp to cut down ash or lower the *p*H, it should be added after the screens, as in time it will strip off the chromium plating.

After screening, the stock should go over bleached pulp rifflers. These should be adequate in total area, and the pulp should run over them slowly, evenly, and at constant consistency. Ribbed riffler cloth takes out more dirt than the smooth napped variety, and we will use the former in our model plant.

The tailings from the bleached screens should be recovered. Whether or not they are mixed with the unbleached screenings is a matter of market only, and usually the bleached tailings do not really need refining, although it is best practice to do so.

After riffling, the stock is thickened, preferably on deckers, and sent to storage tanks big enough to sold at least four hours' run of pulp. The more storage above this minimum up to 12 hours the better. These storage tanks serve to blend the finished pulp and it is far better to arrive at uniformity by blending finished pulps, each of which was treated according to its tests throughout the plant, rather than to achieve uniformity by mixing together wood species and unbleached pulps and arrive at apparent uniformity by having an average of overtreated and undertreated fibers. The stock consistency to the storage tanks should be constant and controlled by consistency regulator.

Machine Room

Our machines will be fourdrinier. The wire will be that mesh and seam which, we find out by bitter experience, fits the machine we have bought. A 24-mesh double twist is a good wire commonly used. The flat suction boxes will be end-grained maple or ryertex, preferably the former. Hot water showers will be put between the suction boxes to result in more water removal. A press roll on the couch is less expensive and will give more water removal than a suction couch, but the latter is easier on the wire and eliminates couch roll jacket or rubber-covered couch roll troubles. Suction will be by Nash vacuum pump or its equivalent.

The white water from the wire pit can be used for dilution purposes anywhere in the system. The best procedure is to use

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it counter current to the stock to the machines. Thus its first possible use is for the machines, then the bleached rifflers, then the bleached screens, then the last washer in the bleach plant, etc. We strongly recommend using the machine wire white water directly back on the machine first rather than using fresh water here.

We will have a first press with a relatively coarse, open "pulp" felt, then a second press with a finer felt, then predryers and a reversed third press with thin, open, smoothing felt. Heating the sheet with predryers before the third press allows it to remove more water than it would from a colder sheet. The construction and size of the press rolls should be such that, with the aid of the table rolls, flat suction boxes, hot water wire showers, wire roll and predryers, the pulp will go to the dryers at not less than 50% B.D. It is understood, of course, that the wet end water removal on a machine is greater on bleached than it is on unbleached at capacity tonnage. Therefore, if our machine it to handle unbleached instead of bleached, it should be wider or have further equipment to compensate.

For general, all-round, satisfactory performance at low steam cost per pound of water evaporated, our "desirable" mill will have a horizontal Flakt dryer.

From the dryer we go to a layboy normally, but provision should be made in our "desirable" mill for turning pulp out in rolls as well. This will necessitate a winder and rewinder, wrapping rolls heading machines, etc.

The pulp presses should be the type with the overhead, downward travel piston. This type will allow installation of proper bale travel facilities from layboy, through the press, to the bale-tying center and thence to storage. We strongly recommend the "Air Flow" type of bale travel for simplicity and ease of handling.

Our pulp will be put into the warehouse on skids or pallet boards by machine and taken out of it and loaded into cars or boats by machine. By this, we refer to Towmotors, Loaders, Lifttrucks, or the like. A properly equipped warehouse can load twelve 50-ton cars with two men in an eight-hour day, and this with no heavy lifting strain on the men. We have deliberately by-passed the steam plant and power house. We will pass over water supply by saying merely that the water must be pure, clean, adequate in supply, and, if necessary, must be sand filtered.

We have mentioned acid-resisting steel and chromium plating in passing, but have not gone into the subject of digester linings, bleach plant vessel linings, conveying equipment, stock piping, etc., etc. Rather we have tried to concentrate on basic principles of operation and have deliberately made statements and recommendations which we sincerely hope will cause constructive criticism and argument, the end result of which will be unanimous agreement on the basic principles of "What Constitutes the Desirable Sulphite Mill?"

And last but not least, let us remember that this Utopian sulphite mill of ours must be a SAFE mill.

Effect of Secondary Factors on Sulphite Pulp Bleaching

V. OLESKEVICH, Chief Chemist
Abitibi Power & Paper Company, Ltd.

The purpose of this paper is to present experimental data obtained from investigations into certain factors involved in bleaching, which, for purposes of classification, have been arbitrarily designated as secondary. The subject matter will be limited to the following: souring, acidulation between stages, flash chlorination, wash waters, washing, and water.

The experiments performed were designed to provide figures which could be used when referring to the influence of the above items in the bleaching process, in particular with regard to their effect on the final brightness of paper pulp and pulp color reversion.

Souring

It is common practice to acidify the pulp after it has been bleached and washed. Our own experience is that if this so-called souring is omitted, brightness of pulp at dry end of machines drops as much as 2 points G. E. brightness. Laboratory experiments under this heading were performed at a consistency of 3.5% and 20 C., with a 30 min. retention time at *p*H 5.5. Pulp used was made from black spruce and had been fully bleached and washed on mill equipment.

Souring with tank acid did not improve brightness of pulp when test sheets were dried in air. However, when thick pads of soured and unsoured pulp were artificially aged by drying at 105 C. in an oven overnight, and brightness sheets made up from them, the drop in brightness on the soured pulp was less by about 2 points G. E.

In another series, made to compare the relative efficiency of tank acid, SO_2 water and hydrochloric acid were employed.

The amount of reagent found necessary to reduce *p*H from 7.2 to 5.5 was:

Tank acid....5.6 lb sulphur per air dry ton
SO_2 water.....2.3 lb. sulphur per ton
Hydrochloric acid.....0.9 gal. 20% HCl per ton

If brightness only is considered, SO_2 water is the most economical to use, but it is not appreciably better than tank acid for this purpose. The amount of acid required per ton is inversely proportional to the consistency at which the souring is done. The above figures were obtained when working at a consistency of 3.5%.

Tests were made to determine effect of retention time, but the results were inconclusive. 15 to 30 minutes are usually sufficient as long as the acid is well mixed throughout the pulp slurry. It was also found that actual consumption of souring agent was almost negligible, even after 90 minutes retention time.

Lowering the *p*H below 5.5 adds to the cost of the treatment without a proportionate increase in benefits derived—and it is also detrimental to life of machine wires and felts.

Acidulation

Pulp for this series was taken from washers, after the first bleach liquor stage. It had already received a chlorination and a liquor stage of bleaching with a wash after

each stage. The treatment consisted of a 45-minute retention time at 3.5% consistency, with various amount of SO_2 water added. The pulp was then washed and bleached at high density (15%) for two and a half hours, with 10 pounds of chlorine per ton as bleach liquor. Caustic soda was added in order to maintain an alkaline condition.

No improvement in brightness was obtained from this type of treatment. The viscosity figures indicate that a lowering of strength properties may occur.

Flash Chlorination

This term is applied to experimental work in which a small amount of chlorine was added to fully bleached pulp. A practical point of application in the mill would be at the rifflers before the screens; consequently pulp samples from the rifflers were used for these experiments. The consistency was about 0.7%. Chlorine was added in the form of freshly prepared chlorine water of known strength.

It was found that 5 lb. of chlorine per ton of pulp were consumed in less than one minute. When larger amounts of chlorine were added, the difference remained as a residual, which did not diminish appreciably even after standing one hour.

The *p*H dropped from 7 to 5.5 when 5 lb. of chlorine per ton were added. Several additional tests were made with and without treatment and the pulp aged in oven overnight.

The benefits that could be expected from the type of treatment described above appear to be negligible. Experimental results indicate only a slight increase in brightness and the effects of ageing are reduced.

Wash Waters

White water from machines is generally used countercurrently throughout the whole bleaching system up to some point, such as the caustic-extracted pulp washer or chlorinated pulp washer, and then sewered. Fresh water enters the system only as make-up and through certain showers. This practice must be followed in order to save fiber and water.

The relative purity of the white water at different points in the system is of interest because if it becomes too heavily loaded with impurities, it cannot wash the pulp properly and may leave organic residues on, or with, the fiber. Such residues are very likely to cause discoloration when the pulp sheet is dried.

Experimentally, some well-washed bleached pulp was soaked in some of the white waters for half an hour at low consistency. The pulps were then tested for brightness, with and without ageing.

White waters with "K numbers" above 2.5 would be unsuitable for final washing and dilution. The tests also show that there is not much difference in aged pulp brightness drop whether white water with average "K number" around 2.2 or fresh water, "K number" 1.9, is used with the pulp.

(Schmidt's "K number" expresses the number of mls. O.1N permanganate reduced by the organic matter in an arbitrarily selected amount of white water.) For these tests, samples of white water were taken from several points in the system, filtered, and 25 mls. used for analysis.)

Washing

Thorough washing is an important item in the preparation of bleached pulp. Evaluation of this item and correlation with final pulp brightness would provide interesting information if washing degree could be accurately defined and determined. When attempts are made to measure the amount of soluble organic residues still retained by pulp after washing, the results are affected by the methods used in removing such residues from the fiber. We found that sixteen hours extraction with hot water was required before "K numbers" and "oxygen numbers" on extract became constant. The oxidizable organic matter in such extracts includes other substances besides the bleach residues. Furthermore, the final brightness of pulp and its tendency to revert in color are also affected by the nature and extent of bleaching and by the water present in the sheet when it goes over the dryers. Thus, it is difficult to separate out the effect of washing by itself.

The use of wetting agents, detergents, and water softeners offers interesting possibilities. Experimental results obtained with metaphosphate (Calgon) are described by Lang and Laurin (Paper Trade J., TAPPI Section, P. 227, May 20, 1943). They added the chemical to wash water used on

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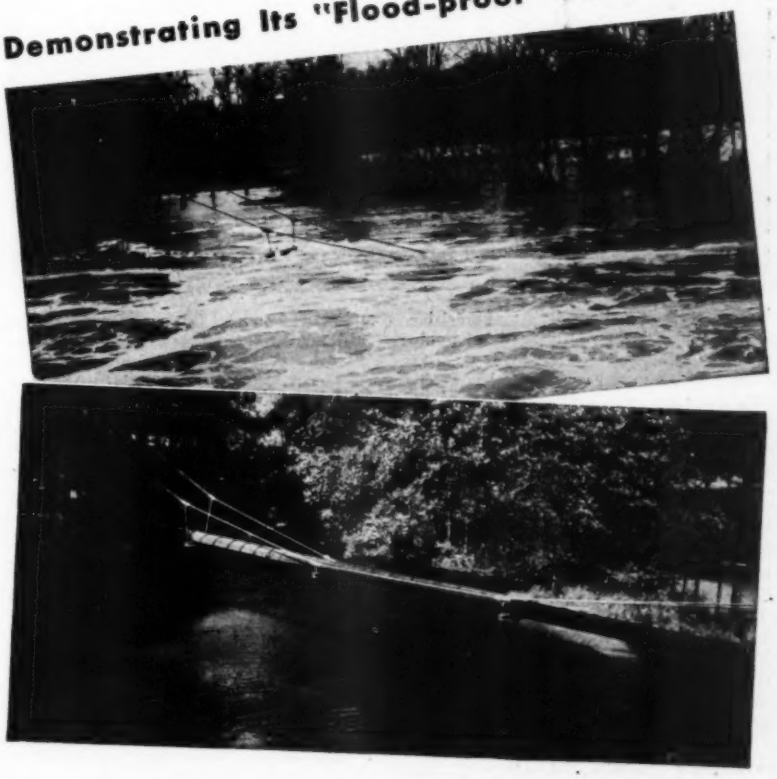

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blown stock and showed that appreciable savings in chlorine resulted when pulp washed in this way was bleached.

We tried this experimentally on pulp going to bleach plant but could not show any improvement in color or saving in chlorine. One portion of the unbleached pulp sample was bleached without further washing. Another portion was treated with Calgon by diluting to about 3% with Calgon in the water, dewatering to 20%, and repeating the process three times. The total amount of Calgon added to the dilution water was 4% based on pulp weight. The pulp was thoroughly rinsed with tap water and bleached according to standard TAPPI method T 219 m-42, until only a trace of chlorine remained. The bleaching times were the same for both sets of bleaches.

A similar treatment was applied to unwashed but fully bleached pulp. The rinsing was omitted but all brightness sheets were made up with distilled water. (TAPPI, T 218 m-45.)

Negative results were obtained throughout. There is a possibility that the use of this chemical would be advantageous where the water used in the system is hard.

Water

Experiments were performed in an endeavor to measure the dye-depositing properties of colored water and the effect of the presence of such water in the sheet. The water used was typical of surface waters draining into James Bay.

(1) Pads of bleached pulp, 10 grams moisture free, 11 cm. in diameter, were prepared on a Buchner funnel, well washed with distilled water, and allowed to dry in air. They were then used as filters for 200, 400 and 600 ml. of the above water. Careful examination of the filtrates through Nessler tubes failed to indicate any drop in color.

(2) A large sample of water was prepared by filtering it through a special sand filter. Six brightness sheets were prepared with distilled water for each test. Two of these sheets were dried without further treatment. Five litres of the above mentioned prepared water were passed through the remaining sheets. Two of these were washed with distilled water (1 litre per sheet). Two sheets were dried without a distilled water wash.

Here absorption and retention of coloring matter is indicated.

The results show that the important factor, as far as pulp brightness is concerned, is the presence of colored water in the sheet.

The color in water may be removed by suitable treatment but the process involves considerable outlay, plus the cost of treatment, both of which depend on quantity required. If clarified water is used for all purposes after the final bleaching stage, the amount can hardly be less than 25,000 gal./ton. However, if the pulp does not absorb an appreciable amount of dye from the natural water available, and if that which is absorbed can be easily washed out, it may be sufficient to displace such water from the sheet before it goes over the dryers. One way of doing this would be to install clear water showers just ahead of the suction boxes on the machines. In this manner, the total requirements of treated water may be reduced to about 2,500 gal./ton.

Abridgments in this section are from papers presented at the annual meeting of The American Pulp and Paper Mill Superintendents Association, held at the Edgewater Beach Hotel, Chicago, May 22, 23, and 24, 1947.

Velocity Steam Research Faster Drying and More Production

PAUL HARRISON, President
Velocity Steam Production Engineering, Inc.

In reaching out for more production from paper dryers, the first step logically is to make sure that the steam in the present equipment is used to best advantage. This step is primarily the work that is being done by velocity steam engineers. We shall see how taking this step leads to logical structural changes in the paper drying equipment.

In Figure 1 the dotted lines represent the conditions of operation in a typical paper-drying machine, and the solid lines show the effect of introducing an improved method of steam flow without changing the machine structure and without speeding up the machine.

This figure shows the changes in two curves: one curve being the temperatures taken at the exposed areas of the series of drying cylinders, the other curve being the temperature readings of the paper at the corresponding dryers.

These two curves taken together represent a new way of determining the effectiveness of a paper-drying machine. The manner in which the board temperature climbs relative to the dryer temperatures is a direct indication of the rate of heat transfer at each point of the machine. If the resistance to heat flow inside the drying cylinders, namely the resistance of condensate films and the resistance of gas films, are effectively reduced by proper steam flow, the board temperatures will definitely and markedly climb upward as indicated by the solid line. The rate of temperature climb of the board will depend on the speed and kind of material being dried and a number of other factors.

In Figure 1 the temperature of the series of drying cylinders is bettered by the improved steam flow. The dryers uniformly attain the maximum temperature for the steam supply. More important, the improved steam flow has lifted the temperature curve of the board by a substantial distance. Bear in mind that the machine speed has not been changed. By now speeding up the machine to take full advantage of this "margin," velocity steam engineers increase paper production from 7 to 10%. Of course, the speed-up brings the paper temperature curve down, but now more tonnage is being dried.

With this over-all picture in mind, the question becomes: What further steps can be taken to increase the drying produc-

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tion of the equipment now that we have stabilized steam flow at maximum efficiency?

A net gain of 7 to 10% production in drying paper is quite worthwhile, of course; but when the same improvement is made in the steam flow in drying equipment in other industries, a much higher level of heat output is attained. The net gain to the higher levels in other fields is on the order of 20 to 35%, instead of on the order of 7 to 10%.

To find clues for further increasing production beyond introducing improved steam flow, it was decided to follow two lines of investigation.

The first line of investigation was a study comparing paper drying equipment with the drying equipment in other industries to find out why higher levels of heat output are attainable more easily in the other industries. It was believed that such a study would bring to light any limitations that may be inherent in the structure of conventional paper drying equipment.

The second line of investigation was to study what happens as the material pro-

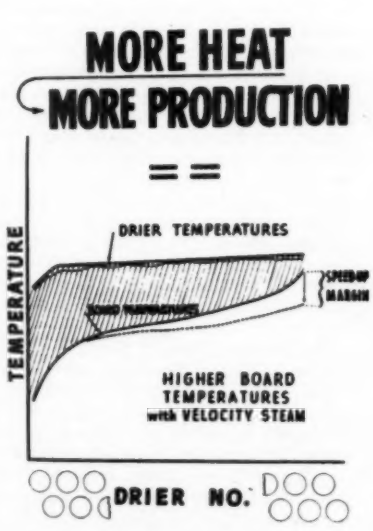

Figure 1

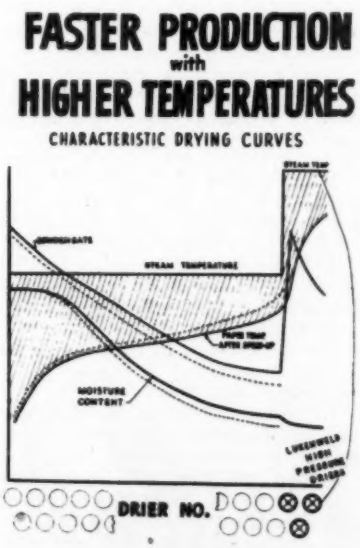

Figure 2

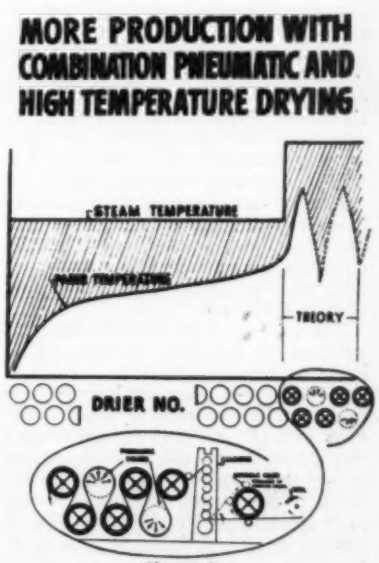

Figure 3

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FLEXIBLE COUPLINGS

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gresses through a paper drying machine with emphasis on the material itself.

The first line of investigation led to the clear cut conclusion that conventional paper drying cylinders are too large in cross section for efficient use of steam. They are so roomy inside that the velocity for a given rate of steam consumption is quite low. It is clearly evident that decreasing the internal cross section of the drying cylinders without decreasing the over-all dimensions would raise production.

This conclusion led to consideration of the Lukenweld Jacketed-Type Steel Dryer Rolls. The steam chamber formed by the Lukenweld Dryer is relatively small in cross section and, therefore, provides higher effective velocity for faster heat flow with given rates of steam consumption. A further advantage is that the Lukenweld Dryer is constructed to stand higher pressures than conventional dryers. The higher temperatures that go with higher pressures offer promising possibilities for increasing production.

This first line of investigation, then, has indicated the desirability of using a jacketed type dryer at higher than usual pressure. The next question becomes: How should such a high pressure, high velocity dryer be used? It should be kept in mind that we are not thinking in this discussion of how to build a whole new paper-drying machine. Few people are thinking in such terms today. In this discussion, we are seeking ways to use the new dryer to increase the drying capacity of an existing paper machine as much as possible with as few structural changes as possible. The answer was deduced from the second line of investigation directed to the progress of the material itself through the drying machine.

Heat, like water and electricity, flows from a higher level to a lower level, and the difference between levels is the driving force. Thus the driving force for transferring heat from the cylinders to the board is approximately represented in Figure 1 by the shaded area showing the difference between the two curves.

Now a temperature differential in a drying process tends eventually to defeat itself by raising the temperature of the material being dried. Figure 1 shows clearly the unavoidable rise in paper temperature that narrows the temperature differential. With any given steam pressure, the drying efficiency of the machine falls off as the board becomes drier. This is our clue. If we are going to use one or more of the high pressure jacketed dryers, we should start at the dry end of the machine.

To follow up this clue, let us see what can be accomplished by starting with the machine represented by Figure 1 and taking four steps:

1. Increase the speed of the machine to take full advantage of the "speed-up margin" as heretofore suggested.

2. Add some Lukenweld Jacketed Dryers at the end of the machine to increase the total heat output.

3. Elevate the steam pressure in added dryers to increase total heat output.

4. Speed up the machine a second time to take full advantage of the heat output added by the Lukenweld Jacketed Dryers.

Figure 2 shows in dotted lines conditions prevailing before these three steps are taken and shows in solid lines the result of taking the four steps.

It is to be borne in mind that the machine has now been speeded up twice: the first time to take advantage of the faster heat flow obtained by improving the use of steam in the original system, the second time to use the additional heat output obtained by adding the jacketed dryers.

In Figure 2 the steam temperature has jumped at the high pressure jacketed dryers. Again a shaded area indicates the temperature differential, that is to say, the difference in temperature between the drying cylinders and the paper in contact with the cylinders. It will be noted that the temperature differential narrows in the expected manner, the drying efficiency of the machine declining, but this differential is restored towards the end of the machine by the added high pressure jacketed cylinders.

The improved thermal potential accomplished by taking these four steps is reflected in the upward shift of the condensate curve in Figure 2. The rate at which condensate is formed is a measure of the rate of heat transfer at each cylinder, and the figure shows clearly how this rate jumps to a high level at the first high pressure dryer.

The figure reveals the striking fact that the addition of the high pressure jacketed

dryers at the end of the machine not only increases the heat output of the machine by the amount of heat contributed by the added dryers individually, but also increases the total heat output by actually raising the heat output of each of the original cylinders. This is clearly indicated by the upward shift of the condensate curve throughout the length of the machine.

Let us take up again the study of what happens as the paper progresses through the machine. In the particular situation represented by Figure 2, there is an initial heating period followed by a period of actual drying.

In the initial heating period the condensate curve is quite high, showing that a large amount of heat is being transmitted to the paper. This transmission of heat is reflected in the rapidly climbing paper temperature curve. The transmitted Btu's are going into sensible heat, not into evaporation, so the moisture content of the paper is not greatly effected. The moisture content curve is practically flat during this initial period.

In the actual drying period the paper temperature keeps climbing and the condensate curve continues to drop. The moisture curve gradually drops, but flattens out somewhat before it reaches the high pressure dryers. At the first high pressure dryer this moisture curve drops sharply, but again flattens out.

Here in the region of the added high pressure dryers, we are again confronted by the fact that a temperature differential tends eventually to defeat itself by raising the temperature of the material being dried. The characteristics of the paper in Figure 2 and the operating conditions represented are such that after the temperature differential has been markedly restored by the first high pressure dryer, the paper temperature spurts up sharply to diminish that differential. The drying power of the machine has again fallen off at the drying end. With the sharp upward turn of the paper temperature curve to contend with, we must now make a further effort to drive out the stubborn remaining moisture.

The first time we met this situation of diminishing heat transfer by adding the high temperature jacketed cylinders to the end of the machine.

We found that this expedient permitted speeding up the machine for higher production and actually raised the heat output over the whole length of the machine.

Since the study of the material as it passes through the machine has been so helpful in arriving at improvements, let us continue this study for clues to the next step for higher production. The significant facts for arriving at a new advance are as follows:

1. The remaining moisture is deep-seated so we have to go into the paper to reach the moisture.

2. The dryness of the paper surface makes it a good insulator against heat flow. We would be greatly handicapped if we merely tried to drive heat into the paper through this insulation.

3. For obvious reasons it is not practical to again resort to higher steam temperatures to renew the temperature differential.

4. The paper is at a high temperature; that is to say, has high sensible heat.

Does this list of significant facts lead to any suggestions for further procedure? Yes. How about using that sensible heat to drive out the deep-seated moisture? How about blowing air into or through the paper either by a blower means or a vacuum means? Would that operation not kill two birds with one stone by lowering the temperature of the paper to restore the temperature differential and simultaneously taking moisture out of the paper?

This line of thought has led us to the arrangement shown in Figure 3, in which high temperature jacketed steam cylinders are teamed with pneumatic cylinders.

After the paper has passed over the first two of the added high pressure Lukenweld Jacketed Dryers at the end of the machine, the paper has high sensible heat, a condition that is ideal for immediate application of forced air drying. The paper is now passed around the first pneumatic cylinder where air under pressure is forced outward through the encircling paper. The air used should have low humidity and be heated above paper temperature.

When the low humidity air is blown through the paper, the moisture is absorbed into the air stream, and the heat for evaporating this moisture comes directly from the sensible heat of the paper. The sensible heat drops, and the paper leaves this first pneumatic dryer at a relatively low temperature.

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Wire with Pitch Spots . . .

is readily cleaned with Magnus Pitchex. Simply work this cleaner (on a brush or broom) into all pitch spots on the wire as it passes the machine head. By the time the wire reaches the showers, deposits are softened and dispersed, ready for flushing away.

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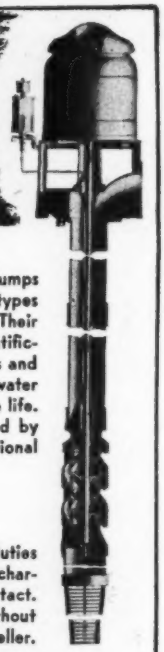

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The dotted extension of the paper temperature curve indicates how the temperature differential has been restored, and this restoration makes it profitable to apply a high temperature again. The paper, therefore, is led over a second high temperature Lukenweld Jacketed Dryer to start a new cycle, which cycle is completed by passing the paper around a second pneumatic cylinder.

The paper is then led over another high pressure Lukenweld Jacketed Dryer before the paper reaches the calenders. Enroute through the calenders, the paper will be sufficiently exposed to cool down again to a relatively low temperature.

Leaving the calenders, the paper passes under a final high pressure Lukenweld Jacketed Dryer as the paper approaches the reel. Under the paper is an idler which is adjustable upward in an arc to cause the traveling paper to contact the periphery of the high temperature dryer to any extent that may be desired. Thus, the wrap of the paper around the high temperature dryer may be varied as required by the final moisture content of the paper. The variation of the contact with the high pressure cylinder may be made automatic by employing a suitable moisture-responsive means to control the idler.

Our production study started with the first logical step of insuring highest possible efficiency in steam flow. This first step is basic. All the further steps are built on it. We have been led to higher and higher production possibilities, based on the first step of taking care of steam conditions existing within the equipment.

It is respectfully contended that any board production improvement program, no matter what its ultimate direction, begins with insuring the best possible operation conditions inside the present equipment. When the heat transfer efficiency of the system is made constant at a high level, the superintendent's task of searching out further ways of improvement for higher production is greatly simplified. The field for error is then narrowed to causes outside the steam system, and the constant efficiency of the steam system itself quickly highlights all of the outside variables, and faster production — more production — is the invariable result.

Silicones for Electrical Insulation

K. N. MATHES
General Engineering & Consulting Lab.
General Electric Company

Design engineers are continually seeking ways to improve design and performance of their equipment with new materials. Research and development engineers at the same time are active in the search for new and better materials to meet the design needs. It is through such co-operation that the rapid progress of recent years has been made. The development and application of Formex and glass fiber illustrate this co-operative effort. Silicone insulation is extending such work.

Application trial of silicone is well started. In the United States several hundred thousand horsepower of silicone-insulated equipment is in use. Some equipment already has been designed with silicone insulation to meet unusually severe operating conditions—for example, rayon spinning motors, which are often purposely stalled and reach very high temperature for short periods of time. However, much of the apparatus has been built with the specific purpose of evaluating the performance of silicone insulation in as many designs to meet as many operating conditions as possible.

Laboratory Evaluation

Laboratory evaluation programs on both silicone materials and completely insulated machines are in progress. The silicones have proved to be particularly resistant to moisture and heat and severe test cycles were designed in order to compare various materials. One accelerated moisture and heat aging test was conducted as follows:

1. Operation for 200 hours at 240 C. (430 Fahr.) winding temperature.
2. Opened and exposed (not running) for 1 week at 100% RH plus dew at 95 Fahr.—dripping wet.
3. High voltage test at 1½ times rated voltage followed by normal voltage operation while still soaking wet.
4. Repeat 1, 2, and 3 above until failure occurred.

One series of eight 5 hp., 550 volt silicone insulated induction motors were subjected to nine of the cycles outlined above. Two motors failed during the fourth cycle and one failed during the seventh cycle. The remaining five motors were satisfactory after nine cycles. Four conventional, glass-fiber insulated, Class B motors all failed during the first cycle. Such tests have been run on coils from apparatus too large to be tested as a complete assembly in the humidity room. Armature coils from a 475 volt, 1950 hp. machine have passed through five moisture and heat aging cycles without failure. In this case the moisture condition was made more severe by the addition of salt vapor. In other modifications of this test, the effect of dirt and cleaning solvents has also been evaluated.

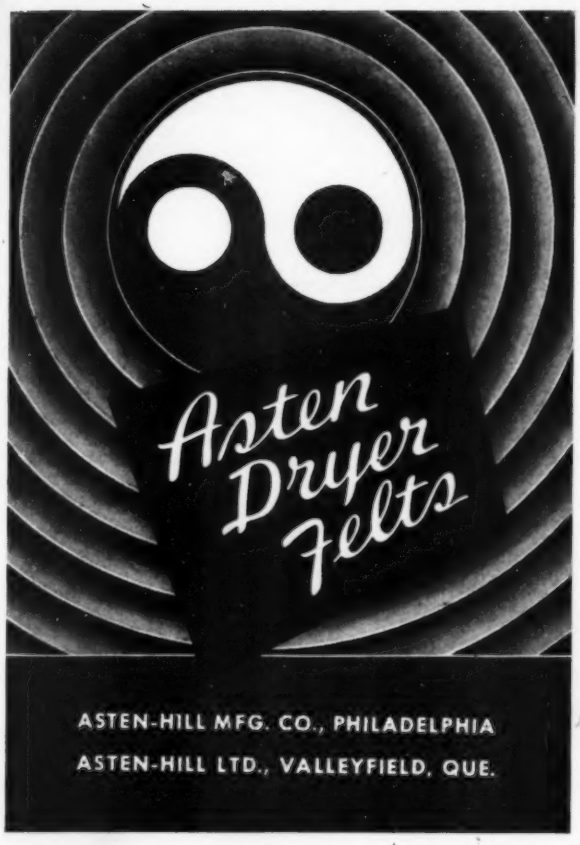
Such tests on coils and completed machines combined with extensive tests on component insulations have led to the following conclusions:

1. Silicone insulations possess exceptional heat resistance. (The A.I.E.E. has proposed a 180 C. hot spot temperature for continuous operation of Class H silicone insulation compared to 130 C. for Class B insulation.)

2. Silicone insulation possesses exceptional resistance to moisture and some chemicals. At relatively high voltage stresses, particularly in the presence of ionizable contaminants, the moisture resistance is decreased. This limitation can often be avoided by design and is important only for random-wound machines.

3. Silicone-treated insulation is not as resistant to oil and certain cleaning solvents as some of the better organic insulating varnishes, but it is far more resistant than some types of black asphalt varnishes commonly used.

4. The mechanical properties of the silicone insulating materials have not as yet been developed to equal some of the



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older materials and special care may be necessary in winding. In addition silicone resins do not have the high strength at operating temperatures of materials such as the unmodified phenolic varnishes used in high speed rotors.

Rewinding with Silicone Insulation

Silicone insulation has such interesting properties that consideration for rewinding certain types of equipment is obvious. Such use of silicone may be justified in the following applications:

1. Equipment which is subject to repeated insulation failure as a result of severe exposure to moisture, chemicals, or high ambient temperatures.

2. Equipment which must have the greatest reliability and may be subject to overloads or emergency situations such as fire.

3. Temporary repair of equipment which has failed from high winding temperatures associated with overloads. It is, of course, much better in the long run to replace overloaded equipment with apparatus designed for the job. Moreover, silicone insulation will not improve operating characteristics in such cases and cannot be expected to permit too great an overload. The "red hot" motor is definitely not to be encouraged.

Silicone insulation is probably not justified for rewinding the following:

1. Equipment which has failed due to overvoltage such as lightning surges.

2. Equipment which has failed as a result of mechanical factors such as excessive vibration.

3. Apparatus which is subject to considerable mechanical force during operation, and depends upon the strength of the insulating varnish,—for example, certain high-speed rotors, welding transformers, etc. (Proper design can in some cases overcome such problems.)

4. Apparatus in which winding space is so limited that extra space required by silicone insulation will reduce the number of turns possible. Such a situation is most likely for equipment wound with small enamel wire or Formex. (At present, silicone-enameled wire has not been developed sufficiently for more than very limited developmental use. Silicone-treated, glass-fiber wrapped wire must be used which takes considerably more space than the film-coated wires.)

Use of Silicone Insulation

If silicone insulation is justified, it must be used properly. Two warnings are particularly important since the use of silicone is still new and does not have the advantage of standardized practices which come from extensive use.

1. The application of silicone insulation may differ from the comparative materials used previously. For example, silicone insulating varnishes usually must be baked at high temperatures—200 C. (390 Fahr.) or even higher; but the temperature may need to be raised slowly in order to prevent excessive bubbling. The manufacturer's advice should be sought and followed.

2. All components of the insulation structure must be compatible and equally heat and moisture resistant. For example, silicone varnish may be of little use if used in conjunction with ordinary enamel wire. The chain is apt to be only as strong as its weakest link! (In some special cases exceptions may be necessary to this rule.)

Magnet Wire

Round and rectangular, single and double glass-wrapped magnet wire pretreated with silicone varnish is available.

Ground Insulation

Silicone-pasted mica is recommended for ground insulation. Several forms are available for different applications — heavy flexible mica sheet without backing, mica sheet backed with glass cloth or thin paper, or mica tape usually backed with thin paper. The paper is used for mechanical support during winding only and burns out in use without significantly affecting mechanical or electrical characteristics.

Silicone-varnish treated or silicone-rubber coated glass cloth may be used as ground insulation for small, very low voltage apparatus, particularly dry-type transformers and other types of stationary equipment.

Turn or Phase Insulation

The insulations used for ground insulation can also be used for turn or phase insulation. Treated glass cloth has greater usefulness than in this type of application.

Wedges and Terminals

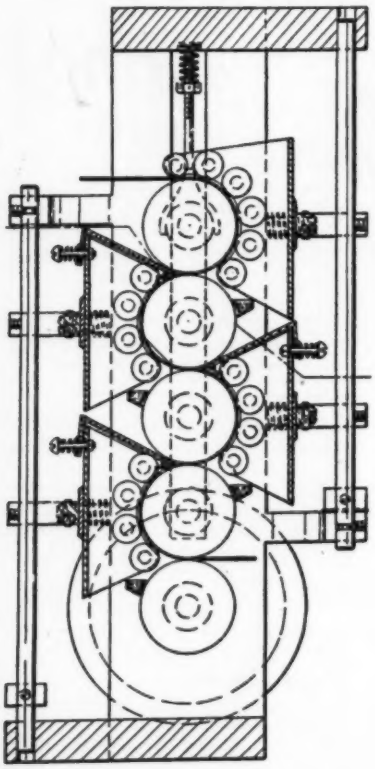
Silicone glass cloth laminates are available. *(Turn to page 1522)*

NEW EQUIPMENT AND SUPPLIES

Paper Feed Mechanism for Calender Rolls

Herbert W. McAfoos, 2930 Fernwood Ave., Alton, Ill., has announced a safety device (patent applied for) for feeding or guiding a paper strip through the rolls in a calender stack. The device, designated as the *Neely Threader*, is designed to thread paper through a stack without manual attention other than that required in making the first nip.

It consists of a series of guide mechanisms, one for each calender roll. Each guide is made up of a number of relatively small-diameter rollers which are



arranged in a frame in such a manner as to circumscribe about 180 degrees of surface of the roll with which it operates. An adjustable spring-tension device holds the individual guide against its mating roll; while a doctor, also resiliently supported, strips the paper from the roll above and leads it to the succeeding roll beneath. A water box is positioned under each guide to collect water draining from the stack.

Motor-Driven Stiffness Tester

A motor-driven stiffness tester, designed for rapid, consistent and accurate tests on paper, fiber products, foil and other thin flexible sheet materials, has been developed by W. and L. E. Gurley, Troy, N. Y.

The tester has a balanced pointer which pivots in jewel bearings, and moves parallel to a sine scale mounted on the base. It is loaded below the center with weights of 5, 25, 50, or 200 grams, fastened 1, 2, or 4 inches from the pivots. The arm carrying the sample being tested is moved by a small-geared synchronous motor which is controlled by a reversing switch on the base.

To make a test, a sample (from light tissue paper up to the heaviest sheet box-

board in common use) is first cut to a standard width and length (½-, 1-, or 2-in. wide, and from ½- to 4½-in long), clamped in a movable clamp so that the free end overlaps the top of the point by ¼-in.; and pressed against the top of the pointer until it is bent sufficient to assume a short arc, shortening it by the ¼-in. overlap. The pointer is then automatically released. The greatest reading of the pointer against the sine scale is averaged in both directions, to eliminate any effects of curl, and may be multiplied by a factor applying to one of 144 combinations of sample and loading weight. The product is expressed as the stiffness of the sample.

Leather V-Belt in Rolls

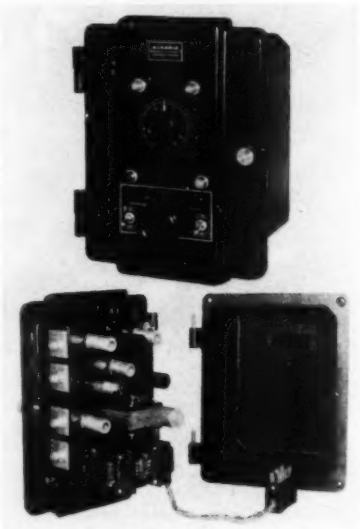
Chas. A. Schieren Co., 30-38 Ferry St., New York, N. Y., has announced the availability in rolls of leather v-belt for single and multiple drives. This belt,

supplied in 100-ft. rolls, packed in boxes, is constructed in such a way that the walls are of flat, full grain leather. It can be made endless to fit any drive, either by a lapped splice or by mechanical fasteners. By using a lap press and tension rod and clamps (also available from Chas. A. Schieren Co.), the belt can be installed endless under any desired tension directly in the grooves on the drive.

Remote Control and Positioning Unit

An automatic electronic remote control and positioning unit for the control of valves, dampers and other mechanical mechanisms has been announced by the Askania Regulator Co., 240 East Ontario St., Chicago 11, Ill.

Three basic items—a transmitter, a control amplifier, and a receiver—make up



the unit. These items can be combined in a variety of ways to produce systems to meet many industrial control needs.

Cast metal cases of the transmitter, amplifier, and receiver are built to withstand shocks, vibration, and corrosion.

Signal lamps and/or audible warning signals are available to indicate position and direction of travel of the controlled equipment.

Installation is simple. Plug type connections are used, where possible. Adjustment is by means of four protected readily accessible set screws. Wiring is located in a drop panel for easy inspection, and complete amplifier can be removed and replaced without use of tools.

Acid Resistant Neoprene Paint

Union Bay State Chemical Co., 50 Harvard St., Cambridge, Mass., has announced an acid resistance Neoprene paint that may be flowed from a full brush, or sprayed if properly thinned with toluol or other thinners. The paint, which dries completely in several hours, produces a translucent amber-colored film. It adheres well to wood, metal and other smooth surfaces.

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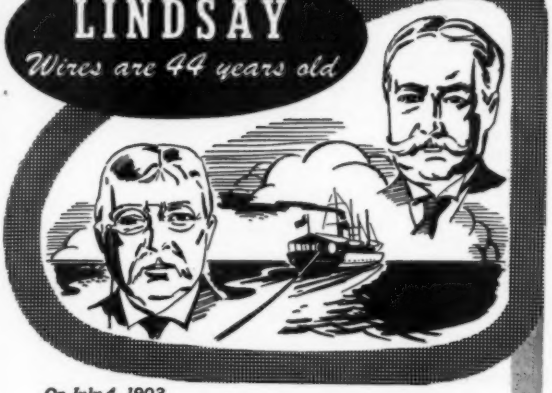
Wires are 44 years old



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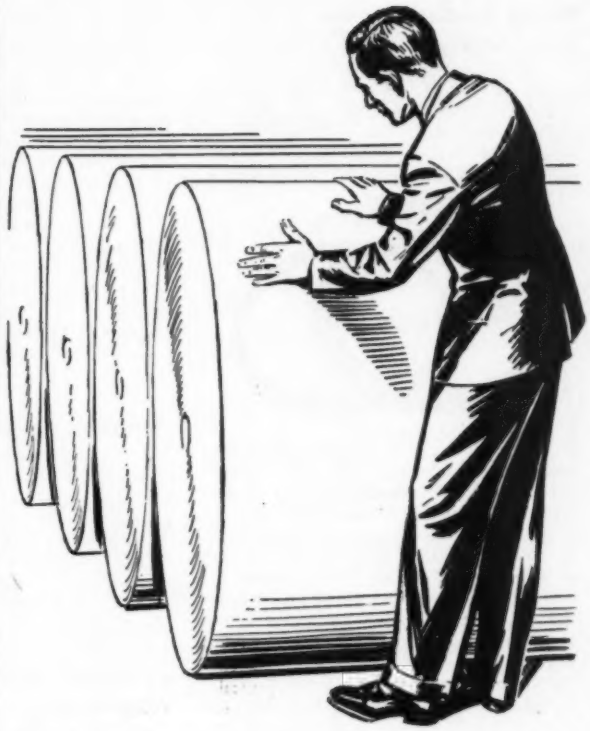

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Plastic Bonded Rod for Hard Facing

Wall Colmony Corp., 19345 John Rd., Detroit 3, Mich., has announced the availability of a new plastic bonded rod in five pound coils. This rod, supplied in ⅛-in. and 3/16-in. diameters, is composed of powdered Colmony No. 6, combined with plastic binder.

As the rod passes through the flame of the metallizing gun, the plastic burns out, leaving the Colmony particles to deposit on the surface being sprayed.

After the desired amount of overlay has been applied (a minimum of .010 in. to maximum of .125 in.), it is bonded to the base metal by means of an oxygen acetylene torch, induction equipment, or a controlled atmosphere furnace. The final result is a molecular bond between the Colmony and the base metal identical to that obtained when the same alloy is applied in rod form.

Stainless Steel Fittings

Tri-Clover Machine Co., Kenosha, Wis., has announced the availability of two lines of light weight stainless steel industrial fittings for use with light gauge O.D. tubing to provide corrosion-resistant liquid conveying lines in paper mills. The types are: (1) Flanged type conical end fittings; and (2) *Zephyrweld* welding fittings.

The conical end type, fabricated from type 316 stainless, is designed primarily for installation where more rapid installation and disassembly is desired. The line includes ells, tees, crosses, return bends, "Y"s, laterals, ferrules, reducers and adapters. It is manufactured for use with commercial tolerance stainless steel tubing having outside diameters of from 1 in. through 10 in. All of the fittings can be adapted to a variety of other fitting and valve types, including conical glass tubing, iron pipe size fittings, and welding fittings.

Flanged couplings for conical end fittings are available in aluminum-alloy, stainless steel, or carbon steel. The couplings are designed to provide simplified installation of the fittings, and are built to withstand working pressure up to 250 lb. per sq. in.

Zephyrweld stainless steel welding fittings are designed for permanent or semi-permanent corrosion-resistant line installations, and are available in sizes from 1 in. through 24 in. O.D., in gauges from 16 to 10. Fittings are fabricated from three standard stainless steel types . . . 304, 347 and 316.

As in the conical end line, the range of *Zephyrweld* welding fittings includes ells, tees, etc., including reducers and adapters to permit use of the fittings with practically all other types now being offered.

Inorganic Maintenance Cleaner

A general purpose inorganic cleaner, designed for maintenance work but suitable for numerous other uses, has been announced by the Pennsylvania Salt Manufacturing Co., 1000 Widener Bldg., Philadelphia 7, Pa. Designated as *Pennsalt MC-1*, the cleaner (a dry, granular material) is packed in 125- or 250-pound plywood drums.

Extension Spindle for Viscometer

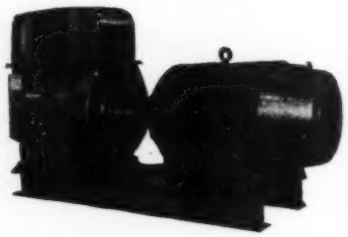
The Brookfield Engineering Laboratories, Inc., Stoughton, Mass., has announced a new extension spindle for use on all Brookfield viscometers except Model MV. The new spindle is interchangeable with the standard spindles, and the change-

over is simple and rapid. It can be supplied in any length needed, enabling the operator to be as far above the liquid being tested as necessary for comfort. Readings can even be made from the floor above by passing the spindle through a small hole in the ceiling; or a platform can be utilized in the same manner to shield the operator.

The spindle, therefore, is suggested for use in taking readings where heat, boiling, fumes, or other physical conditions might prevent operator from getting close enough to the process point to make a reading. Also, it is suggested for use in taking readings of liquids subject to surface turbulence or undulation of liquid level. In this latter case, the spindle goes far enough below the surface to be unaffected by such motions, the readings being independent of depth of immersion within wide limits.

Totally-Enclosed, Unit-Cooled Generator

General Electric Co., Schenectady, N. Y., has announced a totally-enclosed, unit-cooled generator for use in motor-generator sets or in other generating applications in any non-hazardous atmosphere where the ratings involved make totally enclosed, fan-cooled construction impractical.



The generator, available in ratings from 30 to 150 kw, is especially suitable for use in atmospheres common to paper mills.

Cooling of the generator is accomplished by an air-to-air surface cooler which maintains safe winding temperatures at all times. When used in a motor-generator set with a G-E totally-enclosed, unit-cooled d-c-motor, the entire unit is completely assembled at the factory and shipped ready for installation.

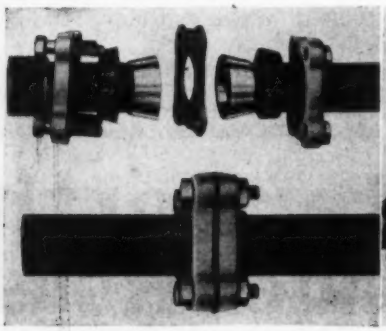
New Organic Chemical

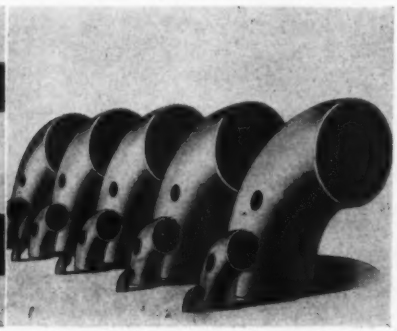
Another new organic chemical, 2-Mercapto-4, 6, 6-trimethyl thiazine (M.T.M.T.)—a yellow crystalline material, insoluble in water but soluble in ketones and esters, has been announced by the B. F. Goodrich Chemical Co., 324 Rose Bldg., Cleveland 15, Ohio. Heterocyclic in nature, M.T.M.T. reacts as a tautomeric compound with the active hydrocarbon atom shifting from sulphur to nitrogen as the reaction conditions are changed. Esters, metal salts and other derivatives are prepared readily and in good yields. M.T.M.T. is easily dimerized and the dimer itself is quite reactive.

As an intermediate M.T.M.T. is expected to find many applications in the manufacture of wetting agents and other specialty chemicals not heretofore possible.

Corrosion Inhibitor for Boiler Feedwater

Carbide and Carbon Chemicals Corp., Room 308, 30 East 42nd St., New York 17, N. Y., has announced the availability of Morpholine, an organic alkali that inhibits corrosion due to carbon dioxide in steam and condensate return lines of





S & W Model "E" Undercut showing safety levers, controls and illuminated index tape. (Guards removed)

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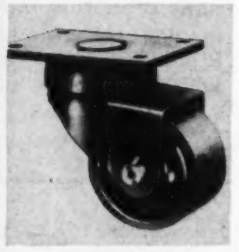

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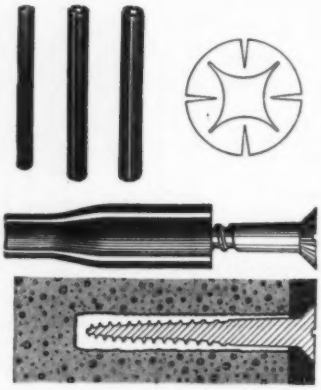
steam heating or processing systems. This chemical evaporates with water in definite proportions, so that any desired alkaline value in the steam generated can be maintained by adjusting the concentration in the boiler. It is suggested by the manufacturer for the treatment of feedwater for boilers supplying low- or medium-pressure steam to heating or processing systems with extensive piping or condensing surfaces, only small amounts being required to inhibit corrosion effectively.

Plastic Anchor for Screws

Holub Industries, Inc., Sycamore, Ill., has announced a screw anchor, the Sandscott plastic expanding anchor, for use with wood screws or lag screws for fastening into concrete, brick, stone, composition board, metal, Bakelite, rubber, glass, wood, etc. The anchor, made slightly larger in diameter than the hole size to



be drilled, is available in seven sizes in various lengths to accommodate all lengths of screw sizes ranging from No. 5 to No. 20, or ¼-in. and 5/16-in. lag screws. Any anchor that is too long can be cut to required length with cutting pliers, knife, or saw. A connecting expansion feature causes the anchor to compress itself and the toughness of the plastic permits the anchor to be driven into a tight hole.

Water Treating Equipment For Removal of Silica

Liquid Conditioning Corp., 114 East Price St., Linden, N. J., has announced the development of equipment for removing silica from boiler feedwater. The equipment employs a standard demineralizing plant consisting of a hydrogen zeolite unit followed by an anion exchange unit.

To effect the elimination of silica, a fluoride such as sodium fluoride is added to the raw water entering the hydrogen zeolite unit. Here, the fluoride is converted into hydrofluoric acid by a resin type of acid-regenerated cation exchange material known as Liquonex CR. The hydrofluoric acid combines with the silica to form fluosilicic acid, while at the same time the Liquonex CR converts the dissolved salts in the raw water into their corresponding acids.

In the second stage anion exchange unit, the fluosilicic acid and the acids formed from the dissolved salts in the raw water are removed by an alkali-regenerated anion exchange resin of high capacity (Liquonex A).

This process, therefore, removes both silica and hardness from the raw water. In a process modification, the silica is removed without the addition of fluorides, by means of a special anion exchanger following the standard demineralizing equipment.

Separator for Steam, Gas or Air

Chicago Manufacturing and Distributing Co., 1928 West 46th St., Chicago 9, Ill., has announced a separator with a maximum rated capacity of 250 cfm, designated as the new Model "E," for delivering clean, dry steam, gas and air. The separator is made of noncorosive metals throughout, has no moving parts, and requires no attention other than draining off condensation that accumulates in the chamber. It is 8 in. in diameter and 15 in. high. It has 1½ in. standard pipe connection.

Lubricated Plug Valve

The H. K. Porter Co., Inc., Pittsburgh 22, Pa., has announced the development and production of an advanced design of lubricated plug valve. This valve, according to the announcement, assures complete and leak-proof shut-off, elimination of leaks through the stuffing box, ease of operation, and trouble-free service. The valve is available in semi-steel, carbon steel, and in alloy and stainless steels.

Sodium Carboxymethylcellulose

Wyandotte Chemicals Corp., Wyandotte, Mich., is now manufacturing commercial quantities of *Carbose*, a technical grade of carboxymethycellulose, by a process for which patents have been applied. It is an adhesive, and a thickening and suspending agent that is finding application in paper as well as in a number of other industrial products and operations.

◆

Silicones for Electrical Insulation

(Continued from page 1517)

Lead Insulation

Silicone-rubber or glass-fiber wrapped stranded wire with silicone-treated glass braid has been used for lead insulation.

Miscellaneous

Untreated glass tape, tying cord, and sleeving are used. Silicone-treated sleeving is also available.

Varnish

Several types of dipping varnish are available with characteristics suited to different requirements.

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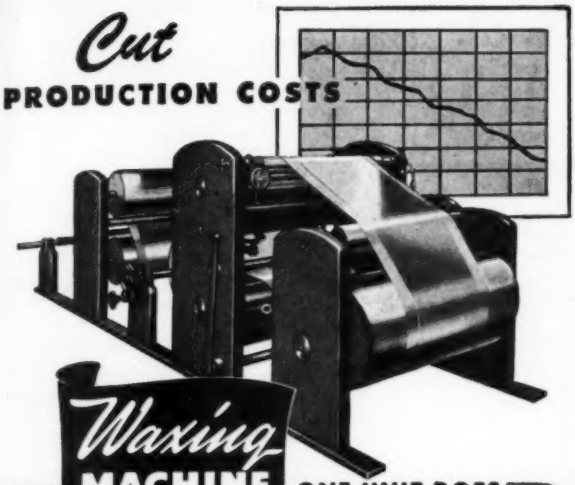

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TECHNICAL DEVELOPMENTS

These abstracts are of the latest developments found in the American and foreign press.

Sulphite Spinning Paper for Binder Twine

A review is given of the evolution in manufacture of spinning papers in Germany, where a change took place from sulphate through a mixture of sulphate and sulphite to the final use of sulphite pulps. The folding endurance of the pulp was found to be a criterion of its usefulness in the manufacture of such papers. Uniformity of strength properties is important.

The minimum specifications for sulphite spinning paper in the machine and cross directions respectively are: 9000 and 3000 meters, elongation 1.6 and 2.5%; folding endurance 2000 and 200; water absorptivity 45-60% and wet strength 15% of the dry strength. The conversion of the paper into binder twine is discussed. R. Trenschel. *Das Papier* 1, 8-76 (1947).

Pulping With Non-Aqueous Solvents

Pulping of various fibrous raw materials with glycerol and ethylene glycol is discussed briefly. The author also includes viscosity data on the various types of raw materials in cuprammonium hydroxide and the solubility of glycol lignin in various ethanol-water and alcohol-benzene solutions. The formation of stearyl lignin and acetyl lignin is described and their viscosities in benzene are shown by means of graphs. The surface tension of alkali lignin in water at various concentrations and the changes in interfacial tensions between water and paraffin oil (or water and benzene) caused by the addition of alkali lignin are also shown graphically. H. Erbring. *Reichsamt Wirtschaftsausbau Cham. Ber. Pruf Nr.* 93, (PB 52008) 81-88 (1940) (in German).

Improving the Wet Strength of Paper

The effects of two cellulose ethers and of the sodium salt of a carboxycellulose on sulphite, kraft, and cotton linter pulps were studied. Under certain conditions very substantial increases in strength were achieved. By simply adding sufficient cellulose ether a greater increase in Mullen and breaking length can be attained than by very considerable extra beating. However from the standpoint of expense, this is impractical.

The effect on burst and breaking length of bleached sulphite, straw, cotton linters, kraft and groundwood of the addition of 5% urea-formaldehyde resin was studied. The percentage increase in strength is much greater for some furnishes than for others, and the effect is less with increasing wetness. The retention of all the high wet-strength urea-formaldehyde resins is low. This was shown both in mill and in laboratory runs.

Another class of materials considered for increasing wet-strength were gelatinous metallic precipitates. In the case of alum, the results are closely dependent on pH, which must not fall below 8.5. S. R. H. Edge *Proc. Tech, Section Paper Makers Assoc. Gt. Britain and Ireland* 27,189-95 (1946), through C. A. 41, 7115.

Troubles Resulting from Resins in Pulp

The author outlines the effect of wood resins on the defibering of mechanical pulp and the methods used to cope with these difficulties. At times the use of small amounts of sodium carbonate or lime are helpful. Various sulphite pulps may contain from 0.7 to 2.5% resins and those of higher resin content have often been insufficiently washed. Resin-containing freshly prepared sulphite pulps are more troublesome than are those that have been aged, especially when the aging is accompanied by drying. Even very small amounts of resins may lead to "broke" on the paper machine. Talc or bentonite absorbs the resin (provided there has been preliminary saponification) but the use of these substances is limited to the manufacture of loaded papers. Otherwise the use of alkaline chemicals like sodium silicate or aluminate may be used in the beater to effect saponification.

Heating pulp suspensions that contain resinous materials aggravates pitch troubles. Violent agitation of such pulps in the presence of air must also be avoided. The author gives practical suggestions regarding the regulation of *p*H, the addition of dyestuffs to the beater and foam prevention. Ordinarily, resin-containing pulps lend themselves best to the manufacture of papers which do not demand excessive beating. P. Goldsmid. *Papeterie* 69, 198-9, 201-2 (1947) (in French.)

Phosphates for Pitch Control

The author states that pitch difficulties in newsprint mills may be alleviated through the use of phosphates. The pitch is a negative colloid and upon coming into contact with positive ions is precipitated either on the fibers or on parts of the paper machine. When groundwood is mixed with sulphite pulp for newsprint, the pitch may be flocculated, even in soft water, by positive ions (calcium) from the pulp. Judicious use of alum, with careful control of *p*H, may result in precipitation of the pitch on the fibers before it reaches the machine. However, the use of alum has the disadvantages of high cost, promoting corrosion, and possible embrittlement of the sheet of paper. The author has determined that the pitch may be kept in a dispersed condition through the use of complex sodium salts of phosphoric acid, such as sodium hexametaphosphate, sodium septaphosphate and tetrasodium pyrophosphate. The effect of these compounds is twofold: they act as dispersing agents for pitch, and they inactivate the pitch-precipitating positive ions by complex ion formation. The addition of 2 to 3 ppm of sodium polyphosphates at the grinders was very effective in reducing pitch difficulties. Total consumption amounted to about 1 lb. per ton of wood, Horace Freeman. *Pulp and Paper Magazine of Can.* 48, No. 8, 72-75 (1947).

Fiber Orientation in Papers

In determining the fiber orientation in paper it is best to use papers that contain less than 1% of fibers that have been stained with an ordinary dye or that have been rendered fluorescent.

An instrument for measuring fiber orientation is described together with a description of the method of plotting the results. In the machine direction on the wire side, orientation is marked. This is much less so on the felt side. The effect of slice on the orientation appears to be slight. Under certain conditions wire shake increases the machine alignment of fibers. Practically the same fiber distribution diagram was shown by papers made on two different machines. Ragnar Danielsen and Börje Steenberg. *Svensk Papperstidn.* 50, 301-5 (1947) (in English), through C. A. 41, 7116.

Board-making in the Transvaal

A building board plant at Messina in the Upper Transvaal (South Africa) is situated in a region that has practically no rains. No buildings are required to house the plant and the finished product is dried by the sun. The raw material used is baled bagasse sent up from sugar refineries in Natal. The equipment is crude and was assembled from parts that happened to be available, often intended for other purposes. However the finished board appears to be satisfactory. George Becker. *Paper-Maker* 113, No. 2, 84,87 (Feb. 1947); through B.I.P.C. 17,477 (1947).

Electrolytic Recorder Paper

The paper was made up of 60% bleached sulphite and 40% bleached kraft and was dipped into impregnating solutions containing sensitizing agents. A current was applied through an iridium stylus, thus leaving marks at graded voltages. The agents tried included benzidine, o-toluidine, fluorescein, and pyrogallol.

The most stable of the impregnations consisted of a dip into 2 g. benzidine in 100 cc. 85% alcohol followed by a dip containing 10 g. NH_4Br, 3.5 g. disodium phosphate (containing 12 moles H_2O), 1.5 g. monosodium phosphate, and 0.1 g. citric acid. Fungal growth was prevented by the addition of small amounts of sodium fluoride or chlorinated phenols to the impregnating baths. J. E. Currah, E. M. S. Arthur. R. E. Thiers. W. A. E. McBryde, and F. E. Beamish. *Ind. Eng. Chem.* 39. 1286. (1947).

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New Catalogues and Publications

Armstrong Machine Works, Three Rivers, Mich.—A valuable booklet entitled "Controlled Humidification," explaining the need for humidification and the method of achieving it, has just been released by this company. It also includes valuable reference data on humidification requirements for processing and/or storing a variety of materials. Diagrams illustrate the operation of both electrically operated and air operated humidifiers. Ask for Bulletin No. 177.

The Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland 4, Ohio—A booklet issued by this company, "Proof of the Pudding," is descriptive of their new fan-cooled Speedaire worm gear speed reducers. The folder includes photos and descriptions of typical installations. Further information on this reducer may be had by writing for Catalogue No. 300.

The Duriron Company, Dayton 1, Ohio—Now available from this company is a new bulletin, No. 615, describing Durco corrosion-resisting, Series 35 Y valves and Series 36 Angle valves. Cutaway views show the internal construction of the valves, and by means of color, the parts of the valves which are made of special alloys, are indicated. Valve features are listed, as well as complete dimension data on the various sizes. The method by which the valves can be equipped with air operated diaphragm motors for automatic regulation of the flow of corrosive solutions is explained.

The Falk Corporation, 3001 W. Canal St., Milwaukee 8, Wis.—An attractive example of industrial sales literature is the new Bulletin 10,000 issued by this company. It contains descriptions and illustrations of all Falk precision products, such as gears, speed reducers, Motoreducers, couplings, high speed drives, backstops and speed gear drives. The back cover lists services and special facilities to Falk customers.

Hays Mfg. Co., Erie, Pa.—Three folders which may be had on request from this company have been published. No. 117 describes the "Electroflo" valve for appliances and industrial equipment; No. 113 "Mesurflo" control with "Straitflo" strainer, supply line flow rate control, used on water, gas, air and oil, and Folder No. 115 is on "Straitflo" strainer used on water, steam, oil, air-gas supply lines.

Jeffrey Manufacturing Company, Columbus 16, Ohio—Useful information for conveyor users is contained in a new handbook on belt conveyors just issued by this company. It contains complete information on the latest designs of conveyor details, and the necessary engineering data to design a belt conveyor for any application. Antifriction idlers and other equipment are listed. Several pages are devoted to charts and other information. The booklet has a complete index. Ask for No. 785.

The Leslie Co., 159 Delafield Ave., Lyndhurst, N. J.—A new illustrated folder entitled "Controlled Heat" has been issued by this company, descriptive of its new line of Class "T" Self-Contained, Self-Acting, Temperature Regulators. The booklet explains how accurate temperature control can be obtained at reasonable cost for many industrial applications, such as heating water for chemical processes. Also included is data on selection, installation, operation and maintenance.

Link-Belt Company, Chicago—Available for distribution is a new 48-page Book No. 2175, describing the Bulk-flo conveyors. The book is crammed with engineering data, valuable charts, tables and formulas for determining the proper size and operating speed for Bulk-flo conveyors to handle various materials, including soda ash, lime and chemicals. This valuable reference book for the engineer, purchasing agent and works manager concerned with mechanical handling of bulk flowable granular, crushed, ground or pulverized materials, may be had from the Link-Belt Co., 2410 W. 18th St., Chicago 8, Ill., or from the nearest Link-Belt office.

Liquid Conditioning Corp., 114 E. Price St., Linden, N. J.—Just completed by this company is a 60-page bulletin which explains the most advanced and modern methods and apparatus for conditioning water and other liquids. It was prepared by executives of the company who are leading authorities in this field. The bulletin is a revision of a former publication. Each of many different types of water conditioning processes is described and illustrated, and the applications, advantages and limitations of each explained. Specially prepared for the booklet are tables listing the various kinds of gaseous and solid impurities; showing the effects, limits of tolerance for various purposes, methods of removal and residual amount of each impurity after treatment, also a comparison chart showing chemical results produced by various water treatment methods. Diagrams illustrate the principles of construction and operation of the various processes and equipment for softening, clarification and demineralizing of water and other liquids. While one section is devoted to white water and fiber recovery in the paper industry, other sections will be of interest. This book is available to plant executives and engineers who write on company letterhead to Liquid Conditioning Corp., Dept. R. A., 114 E. Price St., Linden, N. J., and ask for Bulletin G-1.

Onyx Oil & Chemical Co., Jersey City 2, N. J.—Two new Industrial data sheets have been issued by this company. Sheet-No. Ind. 2, NSAE Powder, shows suggested uses and advantages. This powder can be used as a conditioner for paper mill felts, breaking in new felts, and reconditioning loaded felts. Sheet-No. Ind. 3, Maprofix NEU Powder, tells how this can be used for de-inking and reworking of paper.

Surface Combustion Corporation, Toledo 1, O.—Offered by this company is a colorful, eight-page booklet, entitled, "Control Humidity if You Want to Get the Most from Comfort Air Conditioning." It is descriptive of the Kathabar System. The booklet will be mailed upon request made on company or professional letterhead.

Taylor Instrument Companies, P. O. Box 110, Rochester 1, N. Y.—A valuable source of information for beatermen is an eight-page bulletin just released by this company, entitled "Beater Roll Pressure Control Systems." With the aid of charts and graphs, it tells how instruments help eliminate excessive roll pressure, reduce beating time, increase production and save power. It describes two main methods of controlling beater roll pressure. Write for Bulletin 98113.

United States Stoneware Company, Akron, Ohio—Now available from this company is a color circular showing its new laminated vinyl floor tile, "Plastile."

Warren Steam Pump Co., Inc., Warren, Mass.—A folder which describes in detail their six stage, type TH high pressure pump for pressures up to 1200 pounds has been published by this company. A large part of the folder is devoted to a cutaway view of the pump. A table of metal specifications is included. Ask for Bulletin No. 244.

Wheelco Instruments Company, 847 W. Harrison St., Chicago—Just released by this company is their two-color, eight-page Bulletin C2, containing design, operating and specification data pertaining to the new Wheelco Capaciog, "an Electronic Scriber." Measuring, indicating, recording and controlling functions are fully explained, and illustrated with open cut photographs and line drawings. Separate price list is included.

Books

Adventures in Man's First Plastic—written by Nelson S. Knaggs, Hilton-Davis Chemical Co. Division, Stirling Drug, Inc., is primarily a book about waxes. It is made up of a series of romantic stories, each chapter being a story in itself. The book opens with a chapter "Expedition to the Amazon" which relates the adventures of a wax expedition in the dense jungles of the Amazon Basin and tells the story of cauassu wax. Then story by story, the book unfolds in general panorama the story of wax through the ages, and follows with specific stories on carnauba wax, candelilla wax, spermaceti wax, shellac wax, Chinese insect wax, ouricuri wax, esparto wax, beeswax, ozokerite earth wax, omntan wax, and paraffin wax. The last chapter treats of a group of miscellaneuos waxes—bayberry wax, caranda, cotton wax, Japan wax, murumuru, quindio and salenta, raphia wax, sugar cane wax, ucuuba wax, other waxes, synthetic waxes, chlorinated naphthalene, carbowax, hydrogenated castor oil, and other synthetic waxes. The properties of waxes and a bibliography make up a technical reference section; and an index concludes the volume. Published by Reinhold Publishing Corp., 330 W. 42nd St., New York, N. Y., the book is priced at $6.75 a copy.

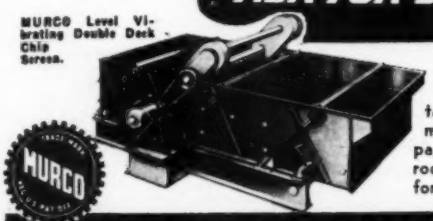
Chemistry for the Executive—This book, written by Ralph K. Strong, Professor of Chemistry, Rose Polytechnic Institute, Terre Haute, Ind., is presented in the form of an imaginary dialogue between "Mr. Executive" and "Chemmer," a trained chemist. Chemmer answers the questions put to him by Mr. Executive, who suggests the topics and leads the discussion. The text is divided into 17 interviews covering the following subjects: chemical elements, oxides, acids and bases, gases and chemical formulas, chemical transformations, solutions and liquids, crystals and solids, colloidal state, earthy materials, organic materials—hydrocarbons, organic materials—oxygen-function compounds, food materials, fuel materials, metallic materials, synthetic materials, and economic scope of things chemical. The book is priced at $6.00 a copy. Its publisher is Reinhold Publishing Corporation, 330 W. 42nd St., New York, N. Y.

Equipment Handbook (American Pulpwood Association)—This book is a looseleaf volume, bound with a three-ring binder sufficiently large to permit the addition of future release material. Published to facilitate the interchange of information pertaining to mechanical equipment suitable for application in the production and transportation of pulpwood, the text is made up of nineteen individual releases (up to November 10, 1947). Each release is brief, includes the source of information used in its preparation, and covers one or more machines or devices and/or methods of operation which can be considered for application in the production and transportation of pulpwood. The index tabs to the volume are titled saws, sulkys and arches, loading and handling, rigging, peelers and barkers, slasher mills, tractors, trucks, and trailers. Distribution of the book is limited to the producer and consumer members of the American Pulpwood Association, 220 East Forty-Second Street, New York 17, N. Y.

WHAT ARE YOUR PAPER MILL AND WOODROOM REQUIREMENTS ?

- MURCO Axial Flow Agitators —both horizontal and vertical
- MURCO Stainless Steel Improved Flat Screen
- Power Driven Forge Hammers
- Collapsible Winder Shafts
- Roll Heading Machines
- Pulpwood Slashers
- Wood Cleaners
- Chip Crushers
- Knot Drills
- Knot Saws

ASK FOR DETAILS

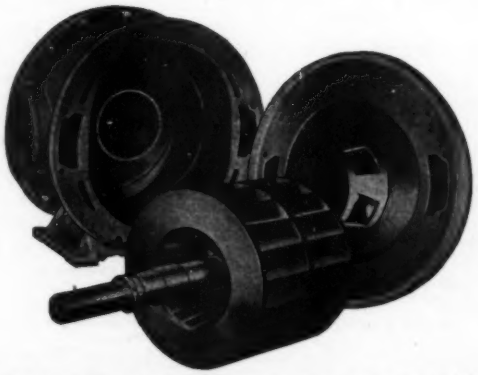


MURCO Level Vibrating Double Deck Chip Screen.

If you want complete details on equipment for your papermill or woodroom, please ask for it.

D. J. MURRAY MANUFACTURING CO. WAUSAU WISCONSIN

SIMPLICITY



NASH VACUUM PUMPS HAVE ONE MOVING PART

Operating advantages made possible by the Nash principle, and present in no other type of vacuum pump, permit a new level of operating economy. Nash Vacuum Pumps have but one moving part, a rotor cast in one piece, and revolving without metallic contact. There are no valves, no pistons or sliding vanes, no internal parts requiring wear adjustment or lubrication.

NASH ENGINEERING COMPANY
SOUTH NORWALK, CONNECTICUT, U. S. A.

GARLOCK 117—furnished either braided or twisted in all sizes from 1/16" to 3/4".

A SUPERIOR VALVE STEM PACKING

GARLOCK 117 Valve Stem Packing is manufactured from long fibre asbestos yarn and lubricated with a special heat-resisting compound. "Packed with Quality" from raw material to finished product, GARLOCK 117 gives superior service on stems of valves of all types operating against steam, hot or cold water, or oil.

THE GARLOCK PACKING COMPANY
PALMYRA, N. Y.

In Canada: The Garlock Packing Company of Canada Ltd., Montreal, Que.

Garlock 117

CURRENT MARKET QUOTATIONS

RAGS (Domestic)

NEW RAGS

Quotations to consuming mills, cents per pound or dollars per hundred pounds, f.o.b. New York, follow:

(All Prices Are Nominal)

	per cwt.
Blue Overalls	9.00 to 9.50
Corduroy, Men's	6.25 to 6.50
Corduroy, Ladies'	6.50 to 6.75
Washables, No. 1	6.50 to 7.00
Percales	7.75 to 8.25
Light Prints, No. 1	7.75 to 8.25
Khaki Cuttings—	
Bleachable	7.00 to 7.50
Unbleachable	6.50 to 7.00
New White Canvas	12.00 to 13.00
New Mixed Blacks	5.50 to 6.00
Canton Flannels, Bleached	11.00 to 11.50
Shirt Cuttings—	
New White No. 1	12.50 to 13.00
White Shrunk	11.00 to 11.50
Silesias No. 1	9.00 to 9.50
New Unbleached	13.00 to 13.50
Fancy	7.00 to 7.50
Linen Cuttings—	
American	8.50 to 9.00
White	14.50 to 15.50
Grey	13.50 to 14.50

RAGS (Domestic)

OLD RAGS

Quotations to consuming mills, dollars per hundred pounds, f.o.b. New York, follow:

(All Prices Are Nominal)

	per cwt.
Roofing—	
No. 1	1.85 to 1.90
No. 2	1.75 to 1.80
No. 3 and No. 4	1.55 to 1.65
Twos and Blues—	
Repacked	3.25 to 3.50
Thirds and Blues—	
Repacked	3.00 to 3.25
Miscellaneous	2.50 to 2.75
Whites, No. 1—	
Repacked	4.50 to 4.75
Miscellaneous	3.75 to 4.00
White, No. 2—	
Repacked	3.50 to 3.75
Miscellaneous	3.00 to 3.25

RAGS (Foreign)

ex dock New York City

NEW RAGS

	per cwt.
New Dark Cuttings	Nominal
New Mixed Cuttings	
New Light Silesias	
Light Flannelettes	
Unbleached Cuttings	
New White Cuttings	
New Light Oxfords	
New Light Prints	

RAGS (Foreign)

ex dock New York City

OLD RAGS

	per cwt.
No. 1 White Linens	Nominal
No. 2 White Linens	
No. 3 White Linens	
No. 4 White Linens	
No. 1 White Cottons	
No. 2 White Cottons	
No. 3 White Cottons	
No. 4 White Cottons	
Extra Light Prints	
Ord. Light Prints	
Med. Light Prints	
Dutch Blue Cottons	
French Blue Cottons	
French Blue Linens	
Checks and Blues	
Linsey Garments	
Dark Cottons	
Old Shopperies	

ROPE and BAGGING

f.o.b. and ex dock New York City

(All Prices Are Nominal)

	per cwt.
Bunny No. 1—	
Foreign	Nominal
Domestic	6.75 to 7.00
Wool Tares—	
Light	6.50 to 6.75
Heavy	7.00 to 7.25
No. 1 Scrap Bagging	5.75 to 6.00
Manila Rope—	
No. 1 large	6.50 to 6.75
No. 1 small	5.50 to 5.75
Sisal Rope—	
No. 1 large	6.00 to 6.50
No. 1 small	5.50 to 6.00
New Burlap Cuttings	6.50 to 7.00
Jute Threads—	
Foreign (Nom.)	6.50 to 7.00
Domestic	6.00 to 6.50
Strings—	
No. 1 sisal	5.50 to 5.75
No. 2 sisal	5.00 to 5.25
Soft jute	4.50 to 4.75
Mixed	2.50 to 2.75

WASTE PAPER

The following are quotations, dollars per ton, for No. 1 packing f.o.b. New York:

(All Prices Are Nominal)

	per ton
Shavings—	
Hard White Env. Cuts	150.00—
Hard White, No. 1	120.00—
Soft White, No. 1	100.00—
Soft White, One-cut	120.00—
Soft White, Misc.	90.00—
Fly Leaf, No. 1	55.00—
Fly Leaf, Woody, No. 1	45.00—
No. 2 Mixed Col. Woody	35.00—
Flat Stock—	
No. 1 Heavy Books and Magazines	27.50 to 30.00
Mixed Books	20.00 to 21.00
Ledger Stock—	
No. 1 white	90.00 to 95.00
No. 1 Mixed (Colored)	75.00 to 80.00
Manilas—	
New Env. Cuttings	130.00 to 140.00
New Env. Cuts, One-Cut	—
Extra Manilas	—
Manilla Tab Cards, Free of Ground Wood	85.00 to 90.00
Colored Manilla Tab Cards	65.00 to 70.00
Kraft—	
New Envelope Cuttings	115.00 to 120.00
Tripled Sorted No. 1 100%	70.00 to 75.00
New 100% Cor. Cuts	65.00 to 70.00
No. 1 Old Assorted	50.00 to 55.00
News—	
White Blank	70.00 to 75.00
Overissue	19.00 to 20.00
No. 1 Baled	15.00 to 16.00
Old Corrugated Containers	22.00 to 24.00
New Corrugated Cuts	35.00 to 37.00
Mill Wrappers	23.00 to 24.00
Box Board Chips	9.00 to 10.00
No. 1 Mixed Paper	11.00 to 12.00

CHEMICALS

f.o.b. shipping point

(All Prices Are Nominal)

Alum (Papermakers)—	
Lump, cwt.	4.25—
Ground, cwt.	4.00—
Powdered, cwt.	4.40—
Blanc Fixe—	
Pulp, bulk, ton	$72.50—
Dry, barrels, pound	82.50—
Bleaching Powder—	
Drums, cwt.	3.00 to 3.50
Casein (Domestic Standard)	
20-30 mesh (bags), lb.	
80-100 mesh (bags), lb.	32.00 to 34.00
Argentine, lb.	31.00 to 32.00
China Clay—	
Domestic Filler Bulk (mine) ton	10.00 to 15.00
Domestic Coating Bulk (mine) ton	15.00 to 25.00
Imported (ship side) Bulk (lump) ton	22.00 to 30.00
Chlorine—	
Tank cars (wks) cwt.	2.25 to 2.50
Gelatine (silicin), lb.	1.40 to 1.65
Glyc. (C.P.) drums, lb.	.39½ to .45
Litharge, powd., bbl., lb.	.16½ to 17
Rosin (Gum)—	
New York, per 100 lbs.	
E	9.25—
F	9.75—
G	9.75—
WW	10.25—
Rosin (Wood), carlots	6.80—
Salt Cake—	
Dom. bulk (wks) ton	22.00 to 24.00
Imp. bulks on dock— (Atl. ports) ton (Nom.)	25.00 to ——
Soda Ash—	
Bulk (works), cwt.	1.10 to 1.20
Paper Bags, cwt.	1.25 to 1.35
Barrels, cwt.	1.35 to 1.60
Soda (Caustic)—	
Solid drums, cwt.	2.65 to 2.85
Ground and flake, drums, cwt.	3.00 to 3.25
Sodium Silicate—	
60 deg., 55 gal. drums, (works) cwt.	1.65 to 2.95
40 deg., 35 gal. drums, (works), cwt.	.80 to 1.45
Starch—	
Pearl, 140 lb. bags, cwt.	7.22—
Pearl, barrels, cwt.	7.22—
Paper, (Sp.) bags, cwt.	7.22—
Powdered, barrels, cwt.	7.23—
Sulphur (Crude)	
(Mine) bulk, long ton	16.00 to —
Talc—	
Dom. 100 lb. bags (mine) ton	20.00 to 28.00
Canadian	35.00 to 45.00
Titanium Dioxide—	
Barium Pig., bbls., lb.	.06½ to .07
Calcium Pig., bbls., lb.	.06¼ to .06⅝
Zinc Sulphide, bbls., lb.	10.50 to 10.75

WOOD PULP

Prices, dollars per short, air dry, ton, on dock American ports and f.o.b. shipping points with former OPA freight allowances, are:

(All Prices Are Nominal)

Bleached sulphite, Swedish	175.00 to 185.00
Bleached sulphite, Finnish	185.00—
Bleached sulphite, dom.	125.00 to 130.00
Easy bleaching sulphite	—
Unbleached sulphite, Swed.	145.00 to 165.00
Unbleached sulphite, Fin.	155.00—
Unbleached sulphite, dom.	115.00 to 125.00
Unbleached kraft, Swedish	140.00 to 155.00
Unbleached kraft, Finnish	147.50—
Unbleached kraft, northern	112.50 to 130.00
Unbleached kraft, southern	90.00 to 120.00
Bleached sulphate, Swedish	175.00 to 185.00
Bleached soda, domestic	120.00 to 125.00
Sulphite screenings, dom.	55.00 to 65.00
Sulphate screenings, dom.	55.00 to 65.00
Groundwood, domestic and Canadian	75.00 to 80.00

PAPER

f.o.b. New York City

(All Prices Are Nominal)

	per ton
Boards—	
Binders	94.00—
Chip	90.00—
Chip, tube and can	95.00—
Chip, full blanding	97.50—
Chip, sgl. mla. lined	95.00—
Coated, white patent .016	120.00—
.020 and heavier	110.00—
Kraft liner	79.00—
Filled News	90.00—
Container	90.00—

Book Papers—f.o.b. mill with quantity, weight, manufacturing and other differentials allowed:

(Per cwt. in ten lots)

Uncoated (Untrimmed)

Book, White (M. F.)—	
A Grade E. F.	14.25—
B Grade E. F.	—
C Grade E. F.	—
D Grade E. F.	—
No. 2 Uncoated Offset 4 sides, White	—
Machine Coated White (Trimmed 4 sides)	
No. 1 Glossy	19.55—
No. 2 Glossy	18.30—
No. 3 Glossy	17.60—
No. 4 Glossy	—
No. 2 Offset	15.25—
C1S Litho (Varnish)	—
C1S Litho (Non-Varnish)	—

Writing Papers—f.o.b. mill with zone, quantity, packing and other differentials allowed:

	per cwt.
Rag Content Bond—	
(In Ton Lots)	
Extra 100% Rag	48.70—
100% Rag	42.70—
75% Rag	33.10—
50% Rag	27.50—
25% Rag	24.50—
Rag Content Ledger—	
(In Ton Lots)	
Extra 100% Rag	48.00—
100% Rag	42.10—
75% Rag	33.10—
50% Rag	28.25—
25% Rag	25.10—

	per cwt
Sulphite Bond—	
Air dry, watermarked	—
No. 1 watermarked	17.00—
No. 2 watermarked	16.00—
No. 4 watermarked	15.25—

	per cwt Zone 1
Sulphite Ledger—	
No. 1 watermarked	17.60—
No. 2 watermarked	16.80—
No. 4 watermarked	16.10—

	per cwt.
Glassine (f.o.b. mill)—	
Embossed (25 lbs. up)	—
Bleached (25 lb. up)	—
Unbleached (25 lb. up)	—
Greaseproof— Bleached (25 lb. up)	—
Unbleached (25 lb. up)	—

	per ton
News—	
Rolls, Standard (Contract)	96.00—
Rolls (Spot)	(Nominal)
Sheets	115.00—

	per ream
Tissues (Carlots)—	
White No. 1	1.75—
White No. 2	1.60—
Bleached Anti-Tarnish	—
Colored	—
Anti-Tarnish Kraft	1.85—
Manila	1.60—
Napkins, semi-crepe (12½ lb. to M shts.) per cs.	.80—
Napkins, full crepe and emb'sed (12½ lb. to M shts.) per cs.	.80—
Toilet, Bleached (M shts.) per cs.	7.60—
Toilet, Unbleached (M. shts.) per cs.	6.40—

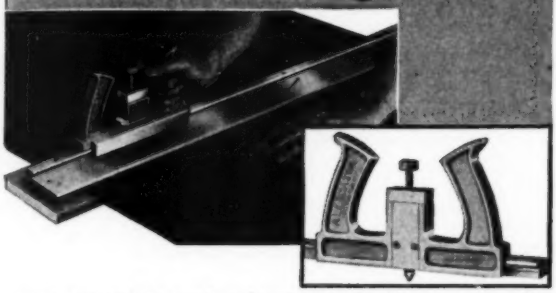
	per case
Towels—	
Bleached	4.75—
Unbleached	4.00—

	per cwt
Wrappings (Kraft)—	
Super-Standard	8.00 to 9.00
No. 1 Wrapping	6.75 to 7.25
Standard Wrapping	6.50 to 7.00
Standard Bag	6.50 to 7.00
Variety Bag	—

Wrappings (Sulphite and Bleached Kraft)—
(Rolls, f.o.b. mill)

	per cwt.
Bleached Papers—	
M.F. & M.G. Waxing, 20 lb. (Carloads only (10,000 lbs.)	—
Drug wrapp., 25 lb.	—
Unbleached Papers—	
Com. Grd Butch. 40 lb.	—
No. 1 Butchers	—
No. 1 Imit. Parch & Dry Fin. Groc. Sulphite, 30 lb.	—
No. 2 Imit. Parch & Dry Fin. Groc. Sulphite, 30 lb.	—
Steam Finish, 50 lb.	—
Water Finish, 50 lb.	—
Manilas—	
Envp. Mfs., Sub. 16-40 (No. 1)	—
Envy. Mfs., Sub. 16-28 (No. 2)	—
Envy. Mfs. (Prices based on large sheets untrim'd ream-marked, in bdls.)	
Wrapp. Mfs. 25 lb. up—	
No. 1	—
No. 2	—
M.G. Sulphite and Kraft (other than Waxing)	
Grade B20 lb.	—
Grade A-23 lb.	—

MAKES CUTTING OF WIDE BELTS *Easy*



Here is a tool that makes the cutting of wide conveyor and transmission belting a simple and easy job—it's the Alligator Wide Belt Cutter for cutting all belts (except those containing metal) up to 60" wide and 1⅛" thick.

The guide rail is clamped or nailed to the belt and the cutter head is pushed across the belt. Each cut is made about ⅛" deep and with several rapid strokes the belt is cleanly and squarely cut.

Bulletin No. BC-350 gives all the details on this new cutter.

Order from your Supply House

FLEXIBLE STEEL LACING COMPANY

4606 Lexington Street, Chicago 44, Ill.

Also sole manufacturers of Alligator Steel Belt Lacing for transmission and conveyor belts, Alligator V-Belt Fasteners and Flex-V Fasteners, for V-Belts, Flexco HD Fasteners and Rip Plates and Hinged Flexco Fasteners for conveyor belts.

HARDY S. FERGUSON & COMPANY

CONSULTING ENGINEERS

200 FIFTH AVENUE **NEW YORK 10, N. Y.**

Consultation, reports, valuations, and designs for the construction and equipment of

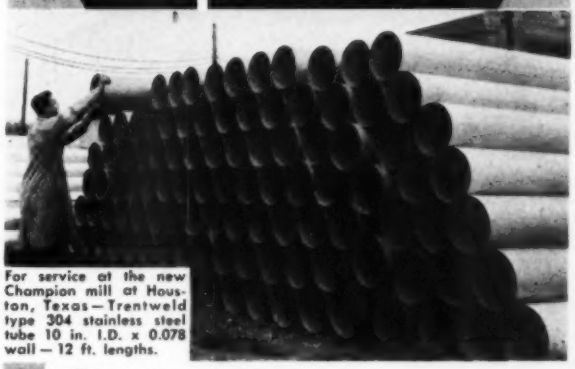
PULP AND PAPER MILLS
STEAM AND HYDRO-ELECTRIC POWER PLANTS
DAMS AND OTHER HYDRAULIC STRUCTURES

COLORS . . .
for Board and Paper

Green Chromium Oxides
Black, Brown, Red, Yellow Iron Oxides
Lamp Black—Umbers—Venetian Reds—Yellow Ochres

C. K. WILLIAMS & CO.
Easton, Pennsylvania

Trentweld STAINLESS STEEL Pipe Lines



For service at the new Champion mill at Houston, Texas—Trentweld type 304 stainless steel tube 10 in. I.D. x 0.078 wall—12 ft. lengths.

Pay back in *economy*
Pay back in *service*
Pay back in *efficiency*

There's a new approach to lines today for piping stock, pulp, water, acids or gasses—a new way to handle them that earns a greater return on your equipment investment than ever before. Take a look at Trentweld stainless steel tubing from these three important considerations.

Immediate Savings Packing great strength into lightness in weight, thin-walled Trentweld pipe lines cut out many hours of high priced installation time. Easy to handle they eliminate the need for costly heavy supports or rigging, are quickly joined by bolted flanges. In many cases, enough money can be saved at this initial point to make Trentweld the cheapest of all pipe lines.

Extended Service Because they are so resistant to corrosion, because they are practically immune to abrasive action, because they maintain essential purity of product, Trentweld pipe lines will serve you satisfactorily for years.

Freedom From Trouble For the reasons just enumerated, Trentweld lines reduce maintenance expense and down time to levels approaching zero, not just initially, but for years on end.

Efficient, enduring, economical . . . and available in all sizes from ⅛" to 22" in lengths up to 20', up to 30" dia. in smaller lengths—these are salient facts on Trentweld. You can quickly find out the details as they apply to you by writing.

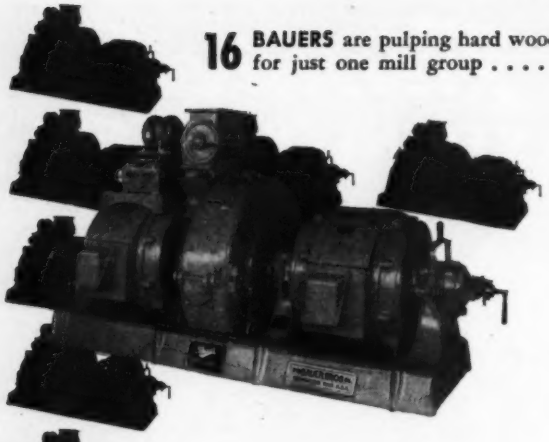
TRENTWELD STAINLESS STEEL TUBES

General Office and Mill
East Troy, Wis.

TRENT TUBE MFG. CO.

District Offices
New York, Chicago

16 BAUERS are pulping hard wood for just one mill group . . . . .



BATTERY OF BAUERS

Mills running board, felt, and comparable grades are making A-1 furnish out of a wide variety of hard woods and hard wood scrap, spruce, and jack pine, screenings and rejects.

One mill group alone, in this particular category, has 16 Bauers in service. Other equally impressive installations can be cited.

If interested in fast, thorough, uniform pulping of these various woods, hard or soft—and the more economical furnishes obtainable—write

THE BAUER BROS. CO.
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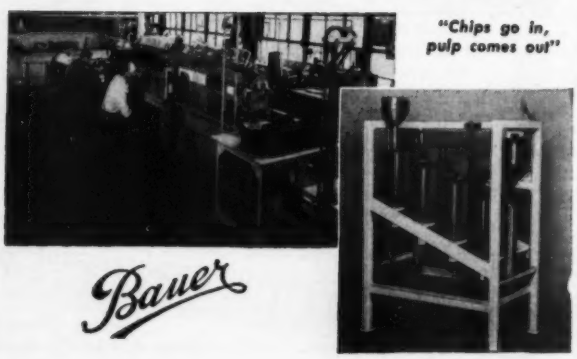

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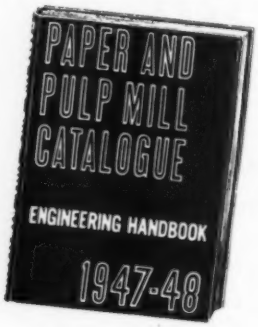

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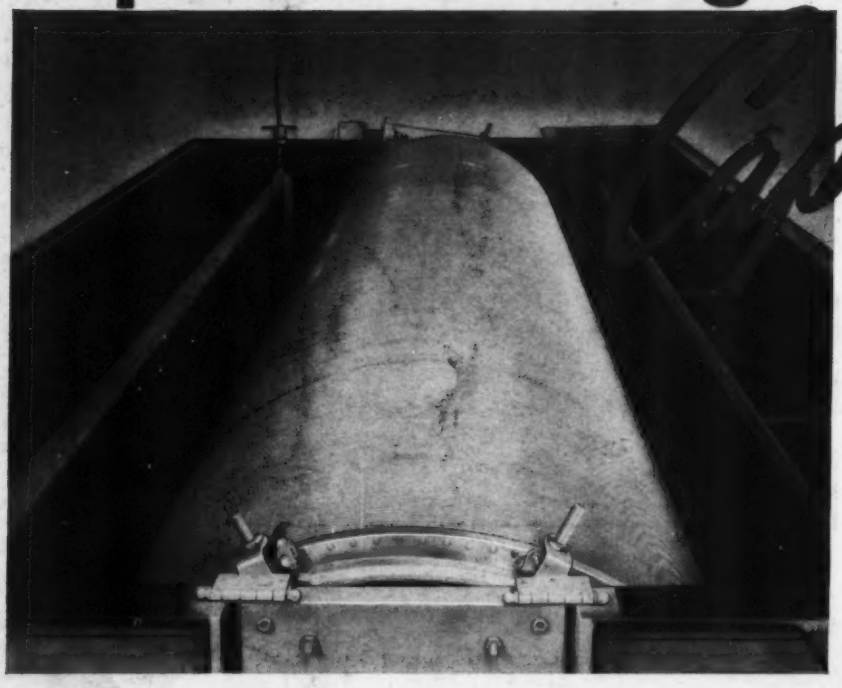

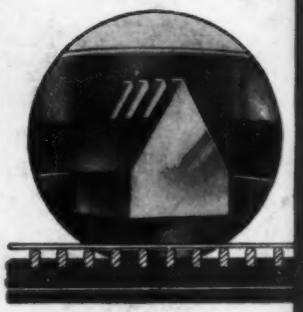

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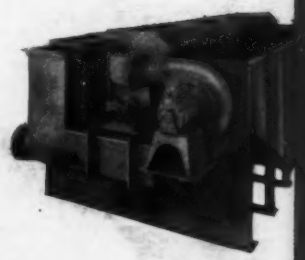

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